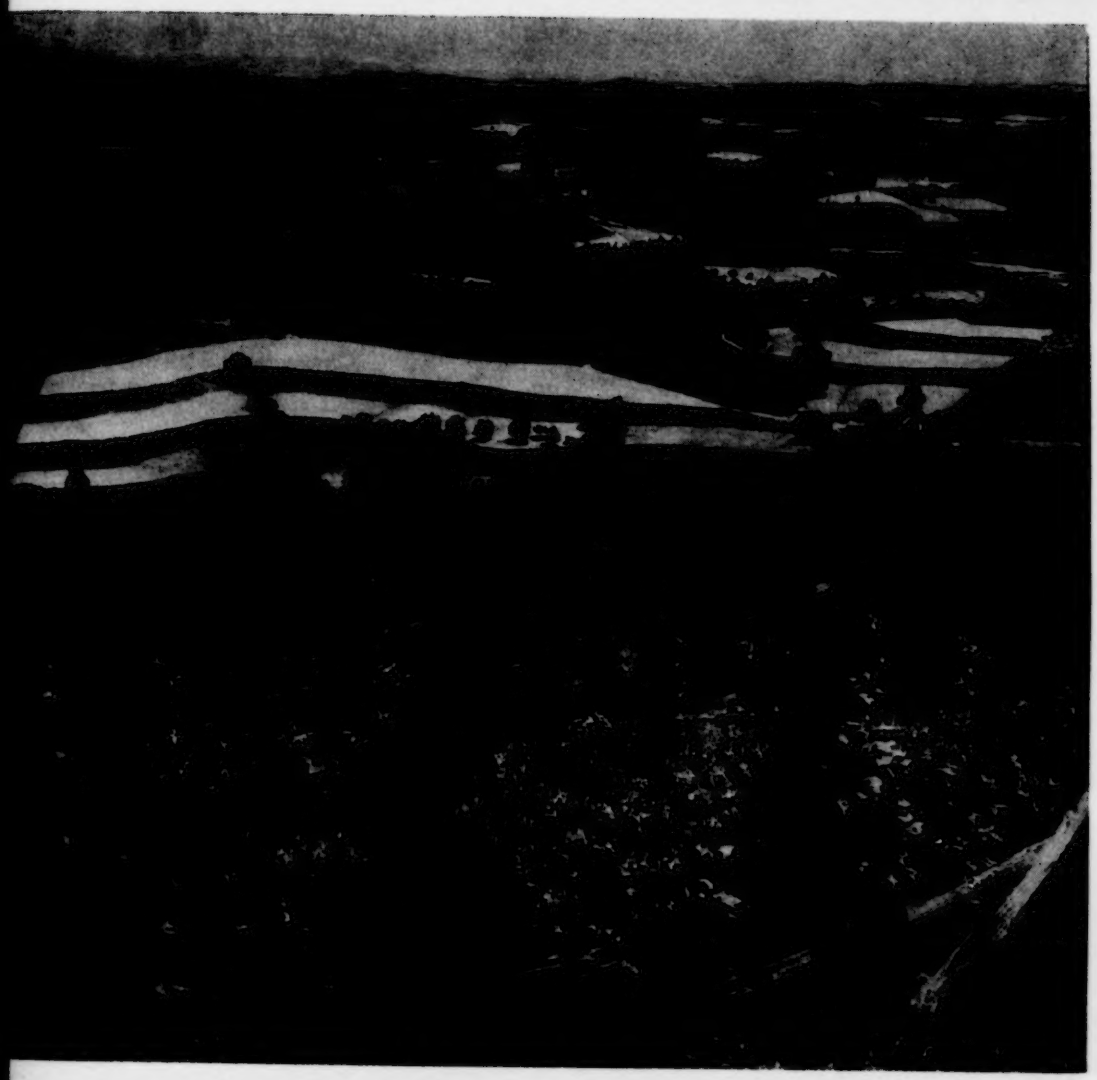

Volume 13, No. 5
September, 1958

Winter Cover Crops

Land-Use Adjustments

Woodland Management

Flood Damages Evaluated

Watershed Dams

Techniques

Reviews

SCSA News

If we continue to limit soil nutrition to N-P-K . . .

Are today's crop yields the best we can expect?

THERE'S no question about the value of the primary plant foods — nitrogen, phosphorous and potash. Farmers everywhere recognize their worth and need. They are beginning to line up also on the side of the trace elements for both plant and livestock nutrition.

But a third group of vital minerals has been somewhat orphaned by the attention given the so-called primary and minor plant foods. Yet these three — calcium, magnesium and sulphur — play an equally important role in the harvesting of big yields.

In spite of this, little recognition is given their essential and vital part in crop growth and fruit formation.

Take magnesium as an example. All plant life needs it. It is a factor in the development of chlorophyll which in turn stimulates every conversion and production function involving life from the soil. Magnesium rivals phosphorus for importance in seed formation. It aids in the fixation of nitrogen by legumes. It builds disease resistance by producing balanced nutrition.

Quick proof of magnesium's need can be gotten from figures showing crop absorption. Four tons of alfalfa take 50 pounds of magnesium oxide equivalent. Ten bushels of ear corn take 1 pound from the soil; two tons of soybean hay, 33 pounds; two tons of peanut vines, 25 pounds; every 300 bushels of sweet potatoes, 17 pounds.

In New York experiments, tomato crops produced $130 more crop value per acre over non-magnesium fortified fields. In Cornell tests, potato yields jumped up 15% when half the potash was derived from magnesium sulphate. Sweet corn tests showed a 15.6% rise in yield with magnesium added to the soil in proper balance. Seed cotton yields went up 93 pounds per acre with magnesium supplying the extra grow-power. Still other recommendations show tobacco needs an average of 30 to 40 pounds of magnesium oxide equivalent in the fertilizer per acre.

From Maine to Florida, Wisconsin to the Atlantic Coast . . . and in many Western areas . . . Extension Service Soil Scientists and Chemists have established areas of magnesium deficiency.

The reasons stem from many causes. Heavy rainfall, erosion and over-cropping of the land have cut deep into natural reserves. And high analysis fertilizers have added to the shortage because the carrier that before contained adequate amounts of magnesium for yearly crop growth has been replaced by increased percentages of N-P-K. An 0-20-27, for example, doesn't have much room for a filler.

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Journal of SOIL AND WATER CONSERVATION

VOLUME 13
NUMBER 5

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COVER: Study and interpretation of the landscape is available to motorists from many overlooks along the Blue Ridge Parkway. Ecological history can be read from this "crazy-quilt pattern" at Mahogany Rock Overlook near Sparta, North Carolina. However, American motorists will have need of many simple "interpretive guides" so that they will learn how to "read the landscape."

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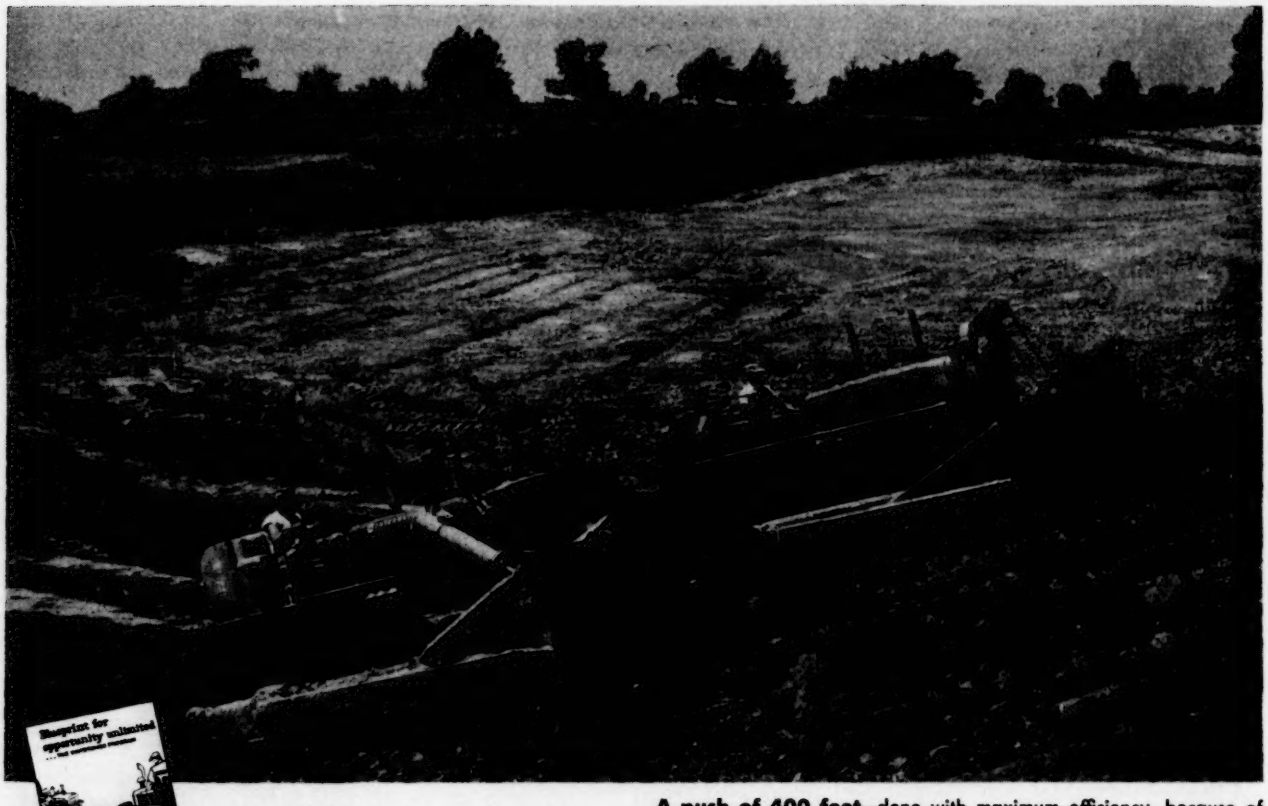

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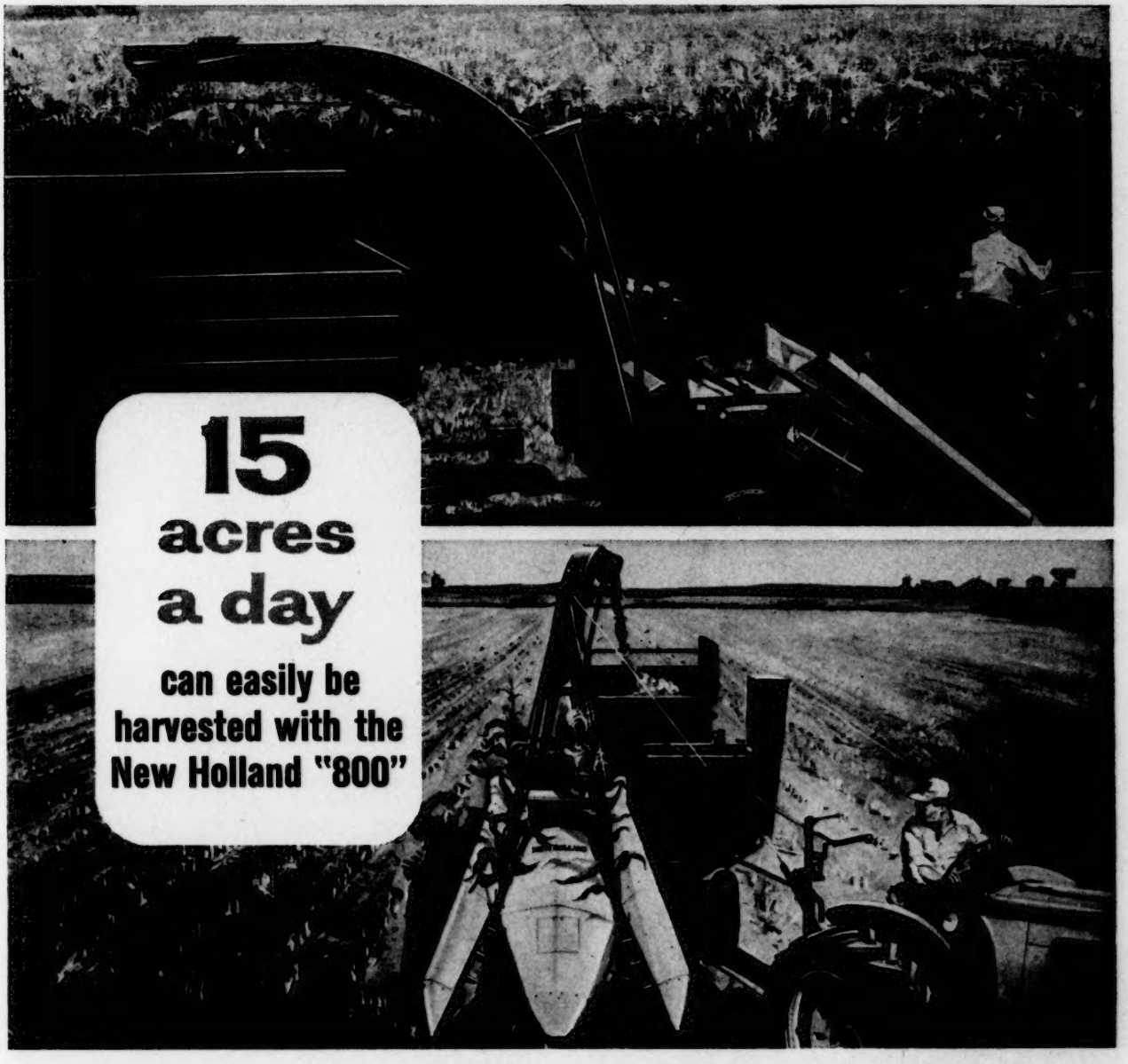

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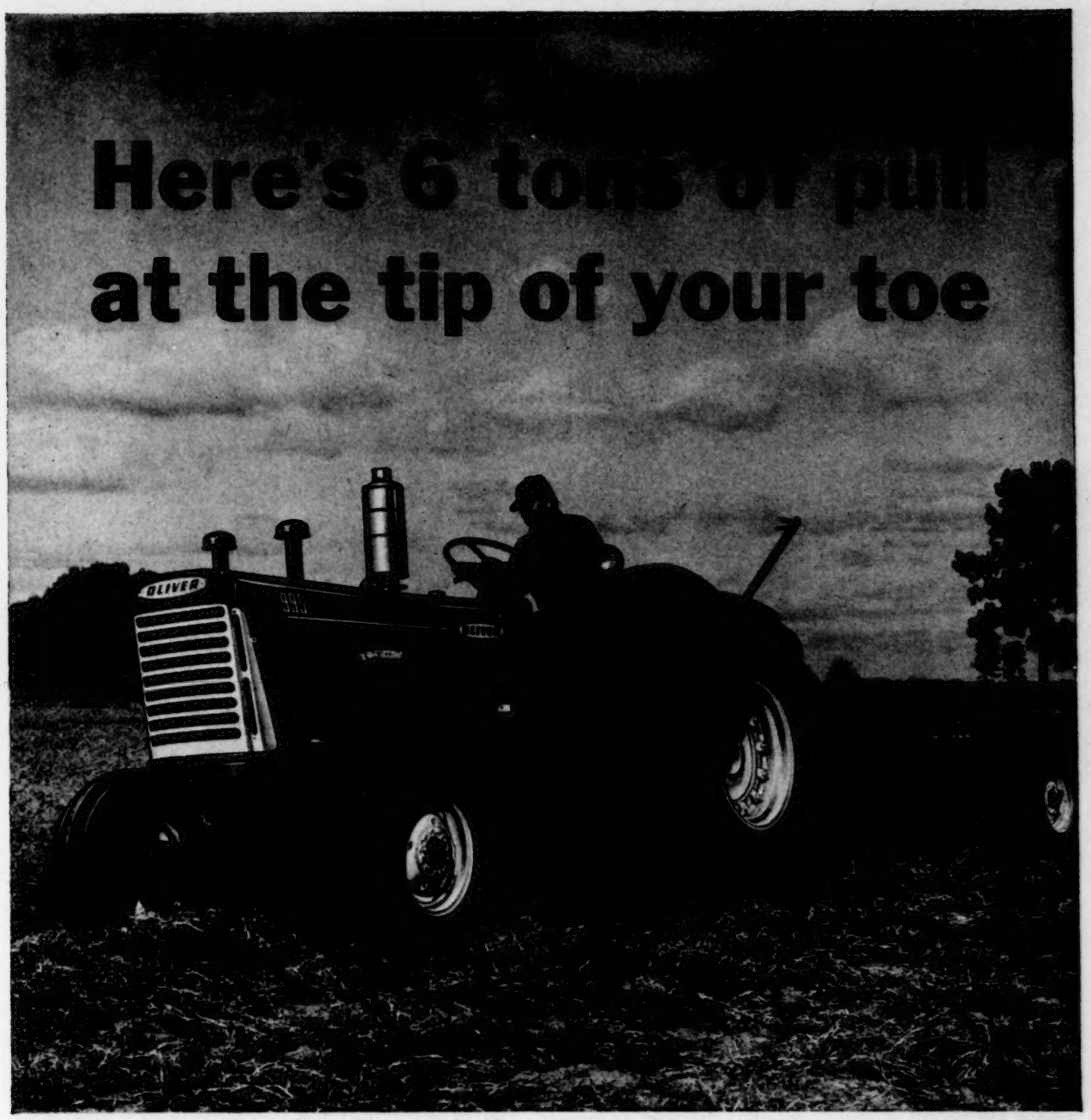

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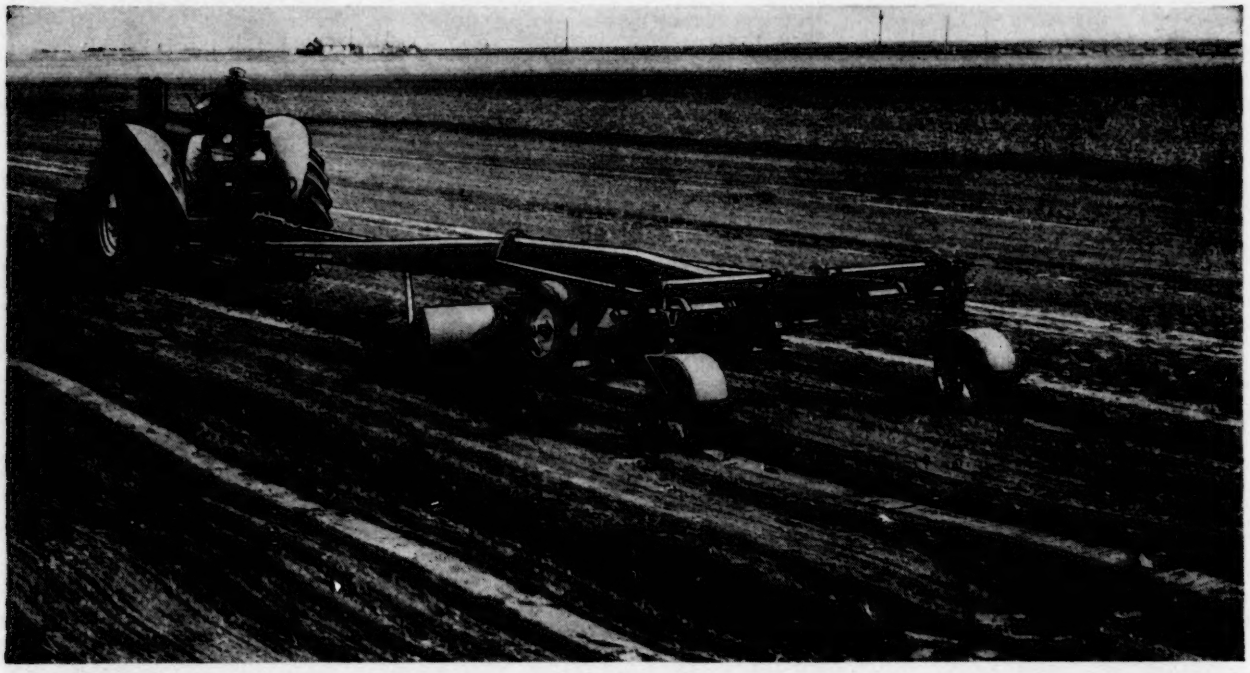

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Winter Cover Crops

RUSSEL E. UHLAND

FARMERS AND RESEARCH WORKERS do not always agree on the merits of winter cover crops for soil and water conservation. What are the research findings on the value of this farm practice?

Published data are limited. However, the soil and water-loss data collected during the past 25 years (prior to 1953 by the Soil Conservation Service, since that time by Agricultural Research Service) at 35 locations in 23 cooperating states have recently been coded and placed on punched cards for machine analysis and tabulation by W. H. Wischmeier of the Soil and Water Conservation Research Division, Agricultural Research Service, USDA, in cooperation with Purdue University at Lafayette, Indiana. This division is also currently cooperating with state agricultural experiment stations in erosion-control research. This paper summarizes some of their findings.

Effects of Cover Crops on Runoff and Erosion

The soil and water loss data from experimental studies on cover crops in Pennsylvania, South Carolina, Mississippi, Georgia, Texas, and Oklahoma, as summarized at Lafayette, are given in Table 1. Results of these studies lead to four major conclusions:

1. **The soil-conserving value** of a winter cover seeding is determined by its residual effect during the succeeding crop season and by the protection provided in the form of cover during the winter months.
2. **The residual value** of a cover crop appears to be associated primarily with a good fibrous root development or with a change in soil structure prior to spring plowing rather than quantity of winter top growth. Well established covers of grass, vetch or crotolaria reduced soil loss during the succeeding row-crop period more than during the winter period. Reductions during the winter months were also significant. Wheat used as a winter cover for cotton in Oklahoma and oats used as a cover for corn in Texas failed to show any such residual effects on erosion the following year.
3. **Both the immediate and the residual soil-conserving benefits** of winter covers, as might be expected, are greatly influenced by the time and method of seeding. Turning under crop residues and volunteer grass in preparation for the late fall seeding of cover crops in Texas actually resulted in increased erosion losses.
4. Under the rainfall patterns that were experienced during the period of the experiments at some of the locations, winter erosion hazards were small enough that **the retention of crop residues on the surface supplied adequate wintertime protection.** Under these conditions, the winter cover seedings had to be evaluated primarily on the basis of their residual effect through the succeeding crop season.

Russel E. Uhland is Research Specialist, Soil and Water Conservation Research Division, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Maryland.

The data presented in Table 1 indicate the need for careful selection of the type of winter covers to be seeded and the importance of early seeding so that the full benefit of residual effects on the succeeding crop may be realized.

At State College, Pennsylvania, ryegrass and oatgrass seeded as a cover crop in corn gave much higher reductions in soil loss and runoff than vetch. Experimental results, together with many observations, show that the residual effect of vetch was much improved when it was seeded in a mixture with rye.

Studies conducted in New York by G. R. Free at Cornell University (unpublished data) show that winter cover crops reduced runoff and wind and water erosion. The benefits derived from cover crops depended very much upon the management, especially the time of seeding and the time of turning the cover crop under. Field brome (*Bromus arvensis*) proved very effective when used in orchards, especially for cherries and peaches. Well managed winter cover crops gave better results than a solid continuous cereal crop. The practice of seeding winter covers is currently being extended to vineyards, but here care must be taken to reduce the competition during the growing season through the practice of limited cultivation and by retaining as much of the residue on the surface as possible.

G. D. Brill at Rutgers University (unpublished data) found that on the coastal plain in New Jersey, rye, wheat, barley and ryegrass planted alone or with crimson clover in late summer or early fall provided good protection over winter. The cover crops also had very beneficial residual effects in reducing erosion and runoff after the cover crops were turned under.

Runoff and erosion studies at Marlboro, New Jersey,

over a 3½ year period showed that a rye winter cover crop reduced soil losses 42 per cent and runoff 13 per cent on a loamy sand soil with 3½ per cent slope. The use of ryegrass and vetch after peas, rye after tomatoes, and ryegrass and vetch after sweetcorn over a nine-year period reduced runoff 55 per cent and soil loss 50 per cent.

In Relation to Precipitation

Data summarized at Purdue indicate that excess or torrential rains account for more than three-fourths of the annual erosion from clean-fallow land or land cropped to cultivated row crops. Cover crops to be effective in reducing runoff and erosion thus must offer protection during the seasons when excess or torrential rains occur.

A summary was made of the precipitation data from a number of the U. S. Weather Bureau first-order stations for the period 1931-1956. This was necessary because the runoff and soil-loss measurements at many of the locations covered only a few years, and it was desirable to know how representative this period of measurement was of the long-time period. These data also make it possible to compare the amount, distribution, and characteristics of rainfall for different agricultural areas. Figures 1 through 5 show the average distribution of precipitation by months along with the amount of precipitation that fell in excess rains between 1937-1956 at various locations.

It will be noted that only a minimum amount of precipitation fell as excess rainfall at most of the listed locations during the winter months. This is the period of the year that the winter cover crops occupy the land. This means that if the cover crops are to prove effective in reducing runoff and erosion their effectiveness will have

TABLE 1. Effects of Winter Covers on Runoff and Soil Loss[1]

Location	Yrs.	Reps.	Winter Cover	Succeeding Row Crop	Plots	Runoff (Inches)			Soil Loss (Tons per acre)		
						Winter Period	Succeeding Crop Period	Total	Winter Period	Succeeding Crop Period	Total
State College, Pa.	6	2	Ryegrass [2]	Corn	Check	4.00	.52	4.52	3.18	5.70	8.88
					Cover	3.08	.18	3.26	1.00	1.64	2.64
	6	2	Oatgrass [2]	Corn	Check	4.00	.52	4.52	3.18	5.70	8.88
					Cover	2.94	.20	3.14	1.10	1.95	3.05
	6	2	Vetch [2]	Corn	Check	4.00	.52	4.52	3.18	5.70	8.88
					Cover	3.64	.30	3.94	.88	3.84	4.72
Clemson, S. C.	10	2	Vetch & Rye	Corn	Check	2.09	3.95	6.04	.44	2.97	3.41
					Cover	.38	1.57	1.95	.16	1.25	1.41
	3	2	Ryegrass & Cr. Clover	Corn	Check	3.00	2.00	5.00	.49	4.00	4.49
					Cover	.25	1.28	1.53	.32	1.63	1.95
State College, Miss.	2	5	Vetch	Corn	Check	1.38	2.63	4.01	.03	4.93	4.96
					Cover	.96	1.84	2.80	.00	2.97	2.97
	4	5	Vetch	Cotton	Check	.35	2.77	3.12	.01	12.44	12.45
					Cover	.22	2.21	2.43	.00	8.36	8.36
Watkinsville, Ga.	8	1	Crotolaria	Cotton	Check	4.10	2.52	6.62	.78	1.84	2.62
					Cover	1.57	1.57	3.14	.24	1.00	1.24
Guth., Okla.	6	1	Wheat	Cotton	Check	.49	3.59	4.08	1.28	29.88	31.16
					Cover	.09	2.42	2.51	1.00	31.73	32.73
Tyler, Texas	6	2	Oats [3]	Corn	Check	1.23	5.64	6.87	.18	5.35	5.53
					Cover	1.82	7.32	9.14	.78	8.26	9.04
	6	2	Vetch [3]	Cotton	Check	5.26	4.42	9.68	1.13	6.22	7.35
					Cover	5.18	4.60	9.78	2.62	7.79	10.41
Bethany, Mo.	9	1	Wheat [4, 5]	Corn	Check	3.75	....	....	13.97	....	....
					Cover	2.54	....	....	4.82	....	....
Watkinsville, Ga.	10	1	Cotton Residue [5]			3.83	....	....	.71	....	....
			Vetch			1.69	....	....	.42	....	....
	3	1	Cotton Residue [5]			3.19	....	....	.92	....	....
			Cr. Clover			2.47	....	....	.70	....	....
			Ryegrass			2.02	....	....	.44	....	....

[1]Data supplied through cooperative research in soil and water conservation with state Agricultural Experiment Stations.

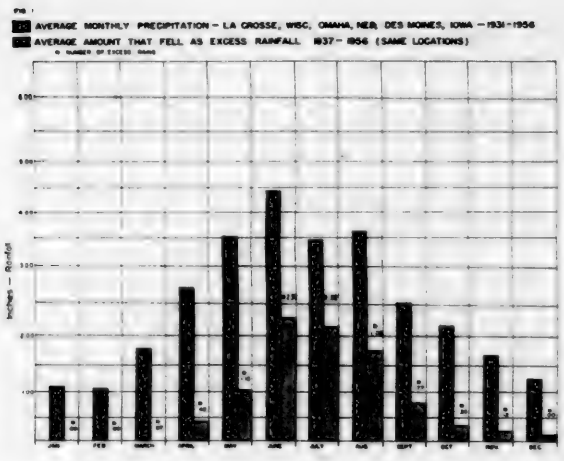
[2]Corn stalks removed after establishment of winter cover.

[3]Crop residues on winter-cover plots turned under to prepare seedbed for oats or vetch cover. Good stands of volunteer grass and crop residues on surface through winter on check plots.

[4]Winter period for wheat following corn in C-W-M rotation compared with losses in corresponding period from continuous corn. All corn residues removed. Low fertility.

[5]Rotation effect confounded with cover effect. Differences in losses under succeeding crop would not necessarily be effect of cover crops.

In an 8-year period on 3% slope at McCredie, Mo. (1942-49) winter runoff and soil loss from the wheat plot in a C-W-SwCl&T rotation were consistently slightly higher than those for the winter period between first and second-year corn without cover seeding in a C-C-O-W&SwCl rotation. Wheat averaged 4.75 inches runoff and 1.25 tons soil loss compared with 4.36 inches and 0.79 tons from the unplowed corn plot.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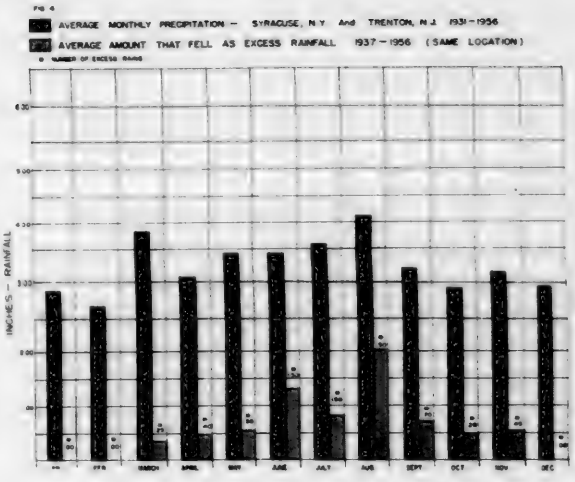
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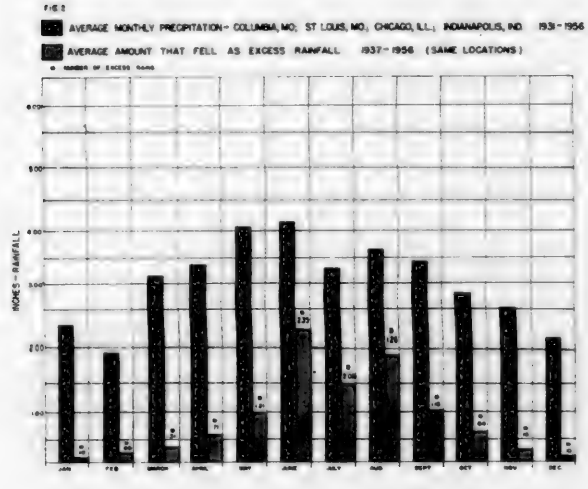
AVERAGE AMOUNT THAT FELL AS EXCESS RAINFALL 1937 – 1956 (SAME LOCATION)
INCHES – RAINFALL


AVERAGE MONTHLY PRECIPITATION – COLUMBIA, MO; ST LOUIS, MO; CHICAGO, ILL.; INDIANAPOLIS, IND. 1931-1956
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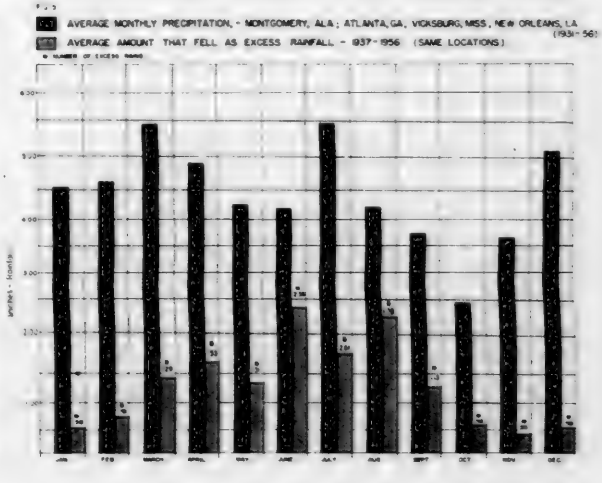
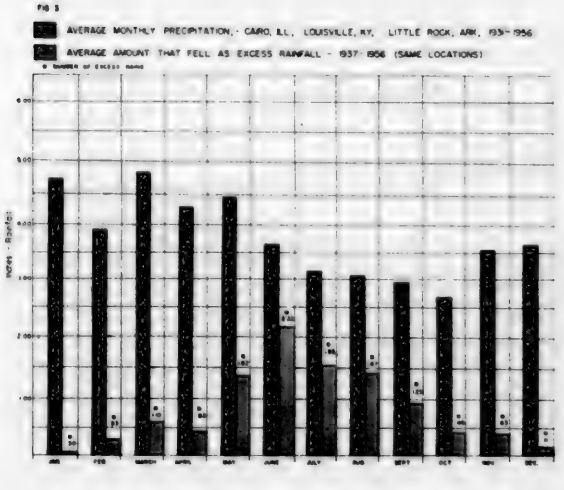
INCHES – RAINFALL


AVERAGE MONTHLY PRECIPITATION, – MONTGOMERY, ALA.; ATLANTA, GA., VICKSBURG, MISS., NEW ORLEANS, LA. (1931-56)
AVERAGE AMOUNT THAT FELL AS EXCESS RAINFALL – 1937-1956 (SAME LOCATIONS)
Inches - Rainfall


AVERAGE MONTHLY PRECIPITATION, – CAIRO, ILL., LOUISVILLE, KY., LITTLE ROCK, ARK. 1931-1956
AVERAGE AMOUNT THAT FELL AS EXCESS RAINFALL – 1937-1956 (SAME LOCATIONS)
Inches - Rainfall

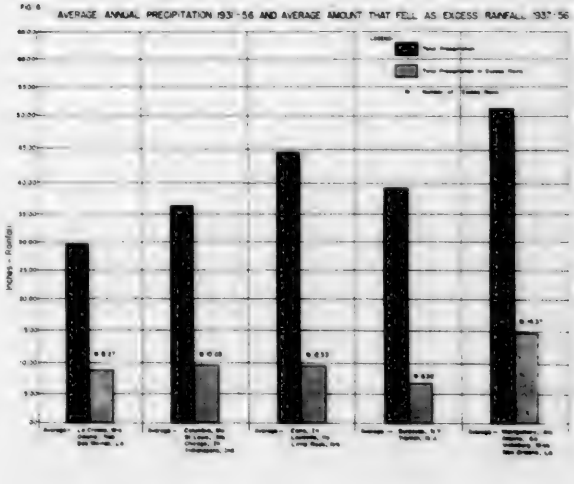

AVERAGE ANNUAL PRECIPITATION 1931-56 AND AVERAGE AMOUNT THAT FELL AS EXCESS RAINFALL 1937-56
INCHES – Rainfall

Figure 7. Location of Weather Bureau sources of data for Figures 1-6.

to extend beyond the period that the cover crops actually occupy the land. This, therefore, calls for early fall seeding and delayed turning in the spring. The early seeding allows for good root development and growth before cold weather. Delayed turning gives the cover crop a chance to make a substantial growth and thereby supply enough organic matter to improve the physical character of the soil and leaves some of the residue on the surface where it is most effective in lessening runoff and erosion.

Figure 6 shows a wide difference in the annual precipitation but even a greater difference in the amount of excess precipitation for different areas of the Eastern States. This figure and the accompanying map show the areas where cover crops can play a major role in protecting the soil against erosion.

The dates of seeding in the fall and the turning dates in the spring also vary widely for different locations as is indicated in Table 2. These dates even within the same area will depend upon the cover crop that is used.

The value to be derived from the growing of cover crops depends greatly upon the way the cover crop is managed. The earlier the crop is seeded in the fall and the later it is turned in the spring without injury to the crop that follows, the more protection it will give against runoff and erosion. The more cover-crop residue left on the soil surface, the greater the erosion-control benefit to be derived from the cover crop.

Effects on Yield and Quality of Succeeding Crops

The growing of winter cover crops, like any erosion and runoff control practice, must be considered also from the standpoint of the effects upon the growth and quality of succeeding crops. If there is a deleterious effect, then farmers will be adverse to adopting a practice even though it may be very effective in controlling runoff and erosion.

In a 11-year study at Marlboro, New Jersey, (unpublished data furnished by G. D. Brill at Rutgers University) tomato yields were increased 3 per cent and sweet corn 18 per cent by the rye cover crop. Cover crops showed no effect on the crop yields for the first two years, but during the last nine years of the experiment the tomato yields were increased 15 per cent and sweet corn yields 43 per cent. Peas were adversely affected by cover crops probably because of the disease factor associated with vetch. Table beets were substituted for peas during the last three years, and they showed an increase in yield of 44 per cent where cover crops were grown.

C. S. Britt and C. S. Slater (2) of Beltsville, Maryland, reported that winter cover crops and their management affected both yield and quality of the succeeding tobacco crop. Ryegrass alone reduced yield, and vetch alone lowered the quality of the tobacco. Highest yields and quality of tobacco followed mixed cover crops of rye and vetch. Late turning of mixed cover crops was better than early turning. It gave larger tobacco yields of equal quality with the early turning. The quality was superior to that of tobacco grown on land without a winter cover crop.

This experiment, started in 1945, compared the effects of five winter cover crops upon the yield and quality of tobacco with a no-cover check. Cover crops were wheat and vetch, rye and vetch, ryegrass and vetch, rye alone and vetch alone. Each plot was split to permit comparison of turning the cover crop early (about April 15) and late (about May 15) in order to investigate the effects of cover crop maturity. One replicate was on Sassafras sandy loam and the other on Evesboro loamy sand. The cover crops were planted each fall after removal of the tobacco crop and after disking, usually the latter half of September. The same plots were used for each treatment each year. All plots received a 400-pound application of 4-8-12 tobacco fertilizer at the time the cover crops were planted. Spring fertilization for tobacco was 1,000 pounds of 4-8-12 per acre.

Yields of the cover crops and also the proportion by weight of vetch to the non-legume were determined at the time of turning. Tobacco-leaf yields were determined after harvesting and curing. The leaves were then sorted into four grades as follows: *bright crop*, consisting of the best leaves; *seconds*, consisting of overripe bottom leaves; *dull crop*, or underripe leaves; and *tips*, the immature leaves at the tops of the plant. Market prices of the cured leaf tobacco were used as a measure of quality inasmuch as they reflect market judgment of quality. The

TABLE 2. Management Dates for Principal Crops in the United States[1]

Summarized by R. E. Uhland from data supplied by Soil Conservation Service Agronomists

Region	State	1. Date for Seeding Winter Cover Crops	2. Date to Plow Under Winter Cover Crops	3. Date for Seeding Winter Wheat	4. Date for Seeding Spring Wheat	5. Date for Seeding Winter Oats	6. Date for Seeding Spring Oats	7. Date for Planting Cotton	8. Date for Planting Corn	9. Date for Seeding Summer Cover Crops	10. Date for Turning Summer Cover Crops
Northeast	Maine	7/1–9/1	5/1–6/1	.....	.....	.....	4/15–5/20	.....	5/20–6/10	5/20–6/15	.....
	New Hampshire and Vermont	7/1–9/1	5/1–6/1	.....	.....	.....	4/15–5/20	.....	5/20–6/10	5/20–6/15	.....
	Massachusetts, Connecticut, & Rhode Island	7/1–9/15	4/15–5/20	.....	.....	.....	4/15–5/20	.....	5/5–6/5	5/5–6/15	.....
	New York	7/1–9/15	4/15–5/20	8/20–10/1	4/5–5/20	.....	4/15–5/20	.....	5/5–6/5	5/5–6/15	.....
	New Jersey	7/1–10/1	4/10–5/15	8/20–10/20	4/1–5/20	.....	4/1–5/20	.....	5/1–6/5	5/1–6/15	8/10–10/1
	Pennsylvania	7/1–10/1	4/15–5/15	8/20–10/15	3/15–5/20	.....	4/1–5/20	.....	5/5–6/5	5/1–6/15	8/10–10/1
	Maryland and Delaware	7/1–10/15	4/10–5/15	8/20–10/20	4/1–5/20	.....	3/15–5/20	.....	5/1–6/5	5/1–6/15	8/10–10/1
	West Virginia	7/1–9/15	4/10–5/15	8/20–10/15	.....	.....	4/1–5/20	.....	5/1–6/5	5/1–6/15	8/10–10/1
Southeast	Virginia	7/1–9/15	4/1–5/1	9/1–10/1	3/1–5/20	.....	3/1–5/20	.....	4/20–6/5	4/20–6/15	9/1–11/1
	West North Carolina	9/15–10/15	3/15–4/1	9/15–10/15	.....	10/1–11/1	.....	4/15–5/15	4/1–4/15	3/15–4/1	1/1–2/1
	East North Carolina	10/15–11/15	3/15–4/1	10/1–11/1	.....	8/15–10/15	.....	4/1–5/1	4/1–4/15	3/15–4/1	1/1–2/1
	West Tennessee	9/15–10/15	3/15–4/1	9/15–10/15	.....	8/15–9/15	.....	4/15–5/15	4/1–4/15	3/15–4/1	1/1–2/1
	East Tennessee	9/15–10/15	3/15–4/1	9/15–10/15	.....	10/1–11/1	.....	4/15–5/15	4/1–4/15	3/15–4/1	1/1–2/1
	South Carolina	10/15–11/15	3/1–3/15	10/1–11/1	.....	9/15–11/1	.....	4/1–5/1	3/15–3/31	3/1–3/15	1/1–2/1
	North Mississippi, Alabama and Georgia	9/15–10/15	3/15–4/15	10/1–11/1	.....	10/1–11/1	.....	4/15–5/15	4/1–4/15	3/15–4/1	1/1–2/1
	South Mississippi, Alabama and Georgia	10/15–11/15	3/1–3/15	10/1–11/1	.....	9/10–10/15	.....	4/1–5/1	4/1–4/15	3/15–4/1	1/1–2/1
	Louisiana	10/15–11/15	3/15–4/1	10/1–11/1	.....	9/15–11/1	.....	4/1–4/30	3/1–3/31	2/15–3/15	1/1–2/1
	Florida	10/15–11/15	2/15–3/15	10/1–11/15	.....	9/15–11/1	.....	3/10–4/15	2/10–3/15	2/1–3/1	1/1–2/1
North Central	Michigan	7/1–9/15	4/20–6/10	.....	.....	.....	.....	.....	5/1–6/10	4/1–8/10	7/15–10/1
	Wisconsin	9/1–10/10	5/1–6/1	9/1–9/15	4/5–5/5	.....	3/25–4/15	.....	5/1–7/1	6/15–8/1	10/15–5/15
	Minnesota	9/1–10/1	5/1–5/20	9/1–9/15	4/15–5/15	.....	4/5–5/15	.....	4/20–7/1	6/15–8/1	10/15–11/1
	Ohio	6/20–7/15	4/1–4/15	9/20–10/10	.....	.....	3/20–5/1	.....	5/1–5/20	5/15–6/20	9/1–9/15
	North Indiana	6/25–8/30	4/1–4/15	9/22–10/10	.....	.....	3/1–4/10	.....	5/10–5/30	5/20–6/10	10/10–4/10
	South Indiana	6/25–8/30	4/1–4/15	10/1–10/20	.....	9/1–9/15	3/1–4/10	.....	5/10–5/30	5/20–6/10	10/10–4/10
	Northern Illinois	9/15–10/15	4/1–4/15	9/1–10/10	.....	.....	3/15–4/15	.....	5/1–6/10	3/15–4/10	10/1–11/10
	Central Illinois	8/20–9/15	4/1–4/20	9/10–10/15	.....	.....	2/15–4/1	.....	5/10–6/15	2/15–3/30	10/1–11/15
	Southern Illinois	9/1–10/1	3/20–4/30	10/1–10/15	.....	9/1–9/20	.....	4/1–5/30	5/1–6/30	.....	.....
	Iowa	8/15–10/15	3/15–4/30	9/10–10/20	.....	.....	3/15–4/30	.....	4/25–5/20	.....	.....
	North Missouri	9/1–10/31	4/15–4/30	9/15–10/31	.....	.....	2/10–4/20	.....	4/15–6/20	.....	.....
	Central Missouri	9/1–10/31	4/15–4/30	9/20–11/30	.....	.....	2/10–4/15	.....	4/15–6/25	.....	.....
	Southern Missouri	9/1–10/31	4/1–4/30	9/25–11/30	.....	10/1–11/25	.....	4/20–6/10	4/1–6/25	.....	.....
	Nebraska	9/1–10/31	3/10–4/30	9/5–9/30	2/10–3/31	.....	3/15–5/25	.....	5/15–6/5	3/15–5/15	.....
	South Dakota	9/1–10/1	4/1–5/10	9/1–9/30	3/20–4/15	.....	3/20–4/15	.....	5/10–5/30	5/20–6/25	.....
	North Dakota	9/1–9/25	5/1–5/20	9/1–9/30	3/20–4/15	.....	3/20–4/15	.....	5/10–5/30	5/20–6/25	.....
	East Kansas	9/1–9/15	5/1–5/20	9/20–10/20	.....	.....	2/20–3/15	.....	4/20–5/20	3/1–4/15	.....
	West Kansas	8/5–9/5	4/1–5/15	9/10–10/20	.....	.....	3/1–3/20	.....	5/15–5/20	3/15–4/15	3/10–3/31
	Kentucky	9/10–10/5	5/1–5/10	9/15–10/20	.....	8/20–9/30	2/1–3/31	5/5–6/10	4/15–6/25	5/1–6/30	4/10–5/10
South Central	Arkansas	8/1–10/30	4/1–4/30	.....	.....	.....	.....	.....	.....	.....	7/15–8/31
	N. E. Oklahoma	9/15–10/15	3/15–4/1	10/1–11/1	.....	8/15–9/15	.....	4/15–5/15	4/1–4/15	.....	.....
	South Central Oklahoma	8/15–9/15	4/1–4/30	9/15–10/15	.....	9/1–10/15	2/1–2/30	.....	4/20–5/10	3/15–4/1	1/1–2/1
	Southeast Oklahoma	8/15–9/15	4/1–4/30	9/15–10/15	.....	9/1–10/15	2/1–2/28	.....	4/15–5/10	4/15–5/30	8/15–9/1
	Northwest Oklahoma	8/5–10/20	3/10–4/30	9/15–10/15	.....	9/1–11/15	1/15–2/15	4/15–5/15	3/20–4/20	4/15–5/30	8/15–9/1
	Southwest Oklahoma	9/1–9/30	4/1–4/15	9/1–10/20	.....	9/1–10/15	1/15–3/15	.....	5/1–1/1	2/20–5/30	6/1–9/15
	Northwest Texas	9/25–10/20	4/5–5/20	9/15–12/1	.....	9/10–10/15	2/1–2/28	4/15–5/31	.....	5/1–7/1	8/15–9/1
	North Central Texas	8/20–9/30	4/15–5/10	8/20–10/15	.....	.....	3/1–3/20	5/1–5/25	4/10–5/1	4/1–4/28	8/1–8/30
	Northeast Texas	9/25–10/20	4/5–5/20	9/15–11/31	.....	9/1–10/15	2/1–2/28	4/15–5/31	3/15–3/30	.....	.....
	East Central Texas	9/15–10/20	3/20–4/30	9/15–11/31	.....	9/15–10/20	.....	4/1–5/15	3/1–3/20	2/20–3/31	7/15–8/15
	Southeast Texas	9/15–10/31	3/15–4/30	.....	.....	9/15–10/31	.....	4/1–5/20	3/5–3/30	2/20–4/30	6/1–6/30
	West Texas	10/1–12/31	11/1–4/10	.....	.....	8/1–12/15	2/1–3/15	2/15–4/20	2/15–4/15	2/1–4/30	8/1–8/15
West	East Colorado	9/20–10/15	4/1–5/15	8/20–10/15	.....	9/1–10/15	.....	4/15–6/1	3/25–4/10	1/1–5/31	3/15–7/31
	West Colorado	9/1–9/30	5/1–5/20	.....	.....	.....	2/1–3/15	.....	.....	2/20–3/31	7/15–8/15
	North New Mexico	9/1–9/30	4/10–4/30	9/1–9/30	.....	.....	5/1–5/30	.....	5/20–6/5	5/20–6/5	8/1–9/15
	South New Mexico	9/1–10/15	5/1–5/30	9/1–9/30	.....	.....	4/1–4/20	.....	4/20–5/10	5/1–5/20	8/1–9/15
	Utah	9/20–11/1	4/1–5/15	8/20–9/30	.....	.....	3/1–3/30	.....	4/10–5/15	.....	.....
	Idaho	.....	.....	9/15–10/15	.....	.....	2/1–3/15	.....	3/25–4/10	4/15–6/15	8/1–9/15
	Northern California	9/1–10/15	4/1–6/1	9/1–10/15	1/20–2/25	9/1–10/15	3/20–5/15	4/15–6/1	5/1–5/31	.....	.....
	Western California	9/15–10/31	3/15–4/30	9/20–10/10	3/20–5/15	3/20–5/15	3/15–4/15	.....	5/1–6/1	4/20–5/30	4/20–5/30	8/1–9/15
	Southern California	10/1–10/31	3/15–4/30	11/1–12/1	3/15–5/15	.....	1/30–2/15	.....	4/20–5/30	4/15–5/15	9/1–11/1
		10/1–12/31	2/15–4/15	11/1–12/31	1/30–2/15	11/1–2/10	.....	.....	4/15–5/15	2/15–4/15	.....
				10/15–12/15	.....	11/1–12/31	1/30–2/15	.....	2/15–4/15	5/15–7/15	10/1–11/15
					.....	11/1–2/30	.....	.....	.....	.....	7/15–9/31

[1]No data supplied for Arizona, Nevada, Washington, and Oregon, where cover crops are seldom used.

data on tobacco yields and price per pound were analyzed by standard statistical procedures.

Table 3 gives the weight of air-dried top growth in pounds per acre of different winter cover crops based upon five-year results at Beltsville, Maryland.

TABLE 3

Weight of air-dried top growth, of various winter cover crops. Average of 5 years of data at Beltsville, Maryland

	Weight of air-dried top growth (Lbs. per Acre)				
	Ryegrass	Vetch	Ryegrass-vetch	Wheat-vetch	Rye-vetch
Early turned	593	883	918	1185	1915
Late turned	1692	2310	2717	3533	6256
Ratio, Late to early	2.9	2.6	3.0	3.0	3.3

Table 4 gives the tobacco yields in pounds per acre as influenced by different cover crops for the eight-year period 1946-1954.

TABLE 4

Tobacco yields, as influenced by different cover crops. Average of 8 years of data at Beltsville, Maryland, 1946-1954*

Winter cover	Tobacco Yields (Lbs. per Acre) Early turned	Late turned	Average
	Pounds per acre		
None	940	932	936
Ryegrass alone	1013	955	984
Ryegrass-vetch	1226	1396	1311
Hairy vetch alone	1219	1427	1323
Rye-vetch	1290	1500	1395
Wheat-vetch	1343	1457	1400

Mean = 1225 Coefficient of variation = 29.0%

*No tobacco planted in 1947.

The per cent of the crop in each grade of tobacco did not vary appreciably between the different types of cover. The lowest per cent of bright crop was 50 per cent for vetch alone and the highest was 57 per cent for ryegrass alone. The dull grade varied from 18 per cent to 25 per cent of the crop. Seconds and bright crop combined varied from 66 to 74 per cent.

The returns per acre for tobacco following different covers are given in Table 5 and reflect the combined effect of the price per pound and yield. The increase in value of the crop when vetch or vetch mixtures are used is evident under early or late turning. When data from the early and late turning are combined, vetch mixtures with rye or ryegrass appear distinctly better than vetch alone.

TABLE 5

Mean market values, of tobacco grown after different cover crops, based on 6 years of data*

Winter cover	Mean market values Early turned	Late turned	Average
	Dollars per acre		
None	427	436	431
Ryegrass alone	493	464	478
Vetch alone	572	617	594
Wheat-vetch	616	710	663
Ryegrass-vetch	647	772	709
Rye-vetch	684	744	714

Mean = 498 Coefficient of variation = 10.6%

*The years 1948 and 1950 are omitted because of houseburn damage.

The question has been asked if late turning of the cover crops with their additional growth places an increased draft on soil moisture and therefore constitutes a hazard of water shortage for the tobacco crop in dry years. No evidence of such a reduction in yields was noted at Beltsville.

B. A. Krantz and W. V. Chandler (4) report results in North Carolina with corn grown continuously from 1944 through 1952, with and without winter cover crops, and with different rates of nitrogen fertilization on Norfolk fine sandy loam soil. Corn yields are summarized in Table 6. In the last four years of this study (1949-52) corn following vetch alone yielded as much as corn following no cover with 220 pounds of nitrogen per acre. Vetch that received 110 pounds of nitrogen made a good growth and gave a significant boost to corn yields over that obtained from corn following the application of 220 pounds of nitrogen but without cover crop.

TABLE 6

The effect of legume cover crops and nitrogen fertilizers on corn yields in Johnson County, North Carolina

N applied Lbs.	Treatments	1944	Corn Yields 1949-52	1944-52
		Bu/Acre	Bu/Acre	Bu/Acre
None	No cover crop	9.9	5.8	6.4
None	Legume cover crop	22.6	90.6	73.4
220	No cover crop[1]	72.0	84.2	83.9
110	Legume cover crop[2]	60.0	93.6	88.1
110	No cover crop[2]	52.2	81.4	70.9
L.S.D.	(.05)	6.8		2.9
	(.01)	9.2		3.9

[1]120 pounds of nitrogen were used in 1944 and 1945. In 1946 and 1947 the nitrogen rate was increased to 180 pounds and in 1948 it was changed to 220 pounds.

[2]60 pounds of nitrogen were used in 1944 and 1945. In 1946 and 1947 the nitrogen rate was increased to 90 pounds and in 1948 it was changed to 110 pounds.

L.S.D. (Least Significant Difference).

Numerous other experiments indicate that the effects of cover crops on succeeding crops vary widely depending not only upon the cover crop used and how it is managed, but also on the physical and chemical properties of the soil and also on climatic conditions, particularly as they affect soil-moisture relations. Although values for average increases in crop yields from use of cover crops can be calculated, any generalized use of such average values would be highly misleading and is not recommended.

Well-replicated experiments can be cited, for example, to show that the effects of cover crops on yields of corn may range from increases of over 80 bushels per acre to actual decreases in yield (3).

By planting winter cover crops an increase of over 80 bushels of corn per acre was obtained in North Carolina over a six-year period with continuous corn on a soil very low in available nitrogen. Yields from continuous corn without a cover crop on adjacent plots averaged only seven bushels per acre, whereas with an annual cover crop of vetch, the yields of corn averaged 90 bushels per acre. The vetch was planted early enough to make a good growth before plowing. Over 100 pounds of nitrogen per acre per year was returned to the soil from the

top growth alone. On adjacent plots without cover crops, the application of 100 pounds of nitrogen per acre resulted in average yields of 83 bushels of corn per acre, while with 200 pounds of nitrogen, the yield of corn was 95 bushels.

The results of this experiment indicate that the vetch cover crop increased the corn yield more than the use of 100 pounds of nitrogen. Non-legume cover crops (oats) had no significant effect on yields of corn produced on land that had high levels of nitrogen fertilization. Lower yields were usually reported where non-legume cover crops were used on soils with low levels of nitrogen.

In general, it appears that especially over short periods of time, the increases in yields from cover crops usually will be regulated by the amount of nitrogen contained in the cover crop.

The long-time effects of cover crops on yields of subsequent crops should not be overlooked, particularly on soils of poor structure. They appear later in this report.

In areas of very low winter rainfall, cover crops may do more harm than good because of competition for available soil moisture.

Effect on Physical and Chemical Properties of the Soil

Cover crops are known to affect materially the physical and chemical characteristics of the soil. These effects must be considered in that they influence the growth of succeeding crops and determine the length of residual benefits of the cover crop upon erosion and runoff control.

The physical conditions of the soil were measurably modified by cover crops at Beltsville (2). The soils of the no-cover plots showed a greater tendency to be compacted by rain during the growing season and were more subject to rill erosion. The erosion resistance of the soil was improved by the fibrous roots and by the incorporation of the crop residues.

The improvement in structure brought about by the different cover crops is shown in Table 7 in terms of the water-stability of the soil on the different plots. The

TABLE 7

Water-stability of soil aggregates in relation to winter cover crops at Beltsville, Maryland, 1954

Winter cover	Water-stability of soil aggregates		
	Early turned	Late turned	Average
	Per cent	Per cent	Per cent
None	36.1	45.4	40.8
Vetch alone	46.7	61.8	54.2
Wheat-vetch	55.7	75.6	65.6
Ryegrass alone	61.6	73.7	67.6
Rye-vetch	63.0	74.6	68.8
Ryegrass-vetch	68.1	82.2	75.1

Mean = 62.0 Coefficient of variation = 10.6%

stability level was lowest on the no-cover crop plots. It will be noted that all of the covers produced improvement, with only moderate improvement under vetch, more under the cereal-vetch mixtures, and most under ryegrass-vetch. This indicates a greater structural improvement with the more fibrous-rooted residues.

The additional growth of the cover crops allowed by late turning accentuated the effect of the residues on the water-stability of the soil. Late turning increased correspondingly the resistance of the soil to erosion.

Legume cover crops can be expected to increase the available nitrogen supply, particularly on soils that are low in organic matter. The increase in nitrogen may vary from practically zero where very little growth is made by the cover crop, to well over 100 pounds per acre. It should also be recognized that for soils that are already high in available nitrogen, legumes will utilize the soil nitrogen and will fix less nitrogen from the air than if the soil is low in available nitrogen. Non-legume cover crops can be expected to decrease the available nitrogen supply in soils low in available nitrogen unless the cover crop is liberally fertilized. On soils high in available nitrogen, on the other hand, a non-legume cover crop may increase the nitrogen available to the subsequent crop by minimizing losses from leaching and denitrification.

In the Beltsville study (2) the benefits of the cover crops on tobacco appeared to be associated more closely with nitrogen nutrition than with improvement in soil structure. Observational evidence indicated a nitrogen deficiency by the poor growth of tobacco following ryegrass alone where structural conditions were best. Excess nitrogen after growing a winter cover crop of vetch provided good growth of tobacco but the quality was poor. Best growth and quality of tobacco followed the use of mixed residues where, apparently, balance in nitrogen nutrition as well as high-level structural stability was maintained.

In North Carolina studies referred to previously, Krantz and Chandler (4) report on some of the soil properties. The effect of the cover crop, with and without additional nitrogen, on the percentage of the soil's total nitrogen and organic matter is shown in Table 8.

TABLE 8

The effect of cover crops and nitrogen applications on the percentage of total nitrogen and organic matter in the soil in Johnson County, North Carolina

N applied Lbs.	Treatment	Total N		Organic Matter	
		1943	1952	1943	1952
		Per cent		Per cent	
None	No cover crop	.066	.051	1.57	1.08
220	No cover crop[1]	.058	.069	1.64	1.29
None	Vetch cover crop		.078		1.51
220	Vetch cover crop	.053	.085	1.54	1.51
220	Oats cover crop	.054	.076	1.45	1.69
L.S.D. (.05)		N.S.	.011	N.S.	.21

[1]The nitrogen rates were 120 pounds in 1944-45, 180 pounds in 1946-47 and 220 pounds in 1948-52 except the vetch cover crop plot only received half this amount until 1948.

L.S.D. (Least Significant Difference); N.S. (Not Statistically Significant).

Allison, Roller and Adams (1) in a 5-year study found that winter cover crops were beneficial both in conserv-

ing nitrogen and in helping to raise the soil organic matter level in Lakeland sand. These findings were in connection with lysimeter studies carried out near Columbia, South Carolina. A rye cover crop greatly decreased the losses through leaching and thereby increased yields of succeeding crops.

Summary and Conclusions

Experimental results together with field experience show that winter cover crops, when planted early and allowed to make a good growth, were beneficial in reducing erosion and runoff. Winter cover crops gave protection against winter erosion but the main benefit was in their residual effect during the succeeding crop season when erosion and runoff losses are much greater than in the winter. Ryegrass and oatgrass, seeded as winter cover crops, gave better protection against erosion than legumes such as vetch and crimson clover seeded alone. The use of a legume either alone or in combination with a grass usually resulted in higher yields of succeeding crops than those obtained when one of the grasses was seeded alone. The yields of row crops following the growing of cover crops, as well as the amount of erosion and runoff, varied widely according to the kinds of cover crops and the way they were managed. The type of soil and the climatic conditions, particularly as they affected soil moisture relations, also governed the benefits from growing winter cover crops.

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★ ★ ★ ★

Conservation is more than terraces to control soil erosion, important as that practice may be. It is more than building flood control dams, although that too must be done. It is more than the planting of trees and grass, despite the fact that this is one of our most important means of achieving conservation. Conservation is using our resources in such a way that the needs of people, today and tomorrow, are best served. It is getting a larger return of the product without eating up the capital. Conservation of soil and water, trees and grass, is meaningless unless it is done for people, to provide the things people need—food, clothing, building materials and even recreation. Conservation will not succeed unless our people understand it.

—SECRETARY OF AGRICULTURE EZRA TAFT BENSON

PHOTOGRAPH CREDITS

Soil Conservation Service: Cover photograph; 220; 221; 222; 224; 225; 226; 227.

R. J. Becker: 215.

Crandon Mills, Inc.: 228, 229.

U. S. Forest Service: 231; 232; 233.

Virginia Agricultural Experimental Station and Extension Service Cooperating with Tennessee Valley Authority: 217; 218.

Felix Summers: Art work—233; 235; 241; cartoon 248.

Land-use Adjustment in Community Development

R. J. BECKER

LAND-USE ADJUSTMENT is an important objective for agricultural community development and conservation programs. Proper land use is necessary for efficiency in agricultural production and prosperity in the entire community. When land use is adjusted to the productive capabilities of the soil and to the needs and goals of farm families, the agricultural community is promoting its development. Belfast Mills Community in Russell County, Virginia, is an example of how a group of rural people made use of this process.

Most of the 8,075 acres of Belfast land is hilly. There are practically no level divides. Valleys are narrow and bottom land areas are small. Less than two per cent of the land (132 acres) is in the 0-2½ per cent slope class; two per cent (165 acres) in the 2½-7½ per cent slope class; about 17 per cent (1,341 acres) in the 7½-15 per cent slope class; about 43 per cent (3,448 acres) in the 15-30 per cent slope class; and 2,313 acres (28½ per cent) in the 30-60 per cent slope class. Over eight per cent of the land is in the 60 per cent and up slope class. The median gradient of the area is 32.2 per cent.

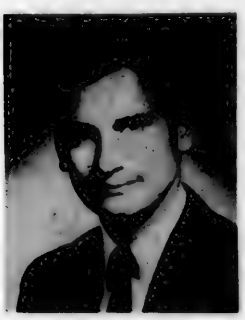
The south side of the area is bordered by Clinch Mountain, which is capped with sandstone. This formation is a very hard and resistant sandstone of white or gray color. The area occupied by this formation is very rough and broken, and a large part of it is occupied by large boulders or solid rock escarpments.

There are 24 soil series represented in the area, that compose 69 soil types. The geologic material from which the principal soils have developed consists of limestone, shale, mixtures of limestone and shale, sandstone and shale, and colluvial beds of sandstone and shale. The soils of the Belfast Mills area have been classified in three land-use groups: *crop, pasture,* and *forest soils.* The crop soils are further divided into *first-class, second-class* and *third-class* groups. The soils are classified on the basis of characteristics that are most significant to the management of land for the production of plants.

Only a third of the soils is suitable for cropping. Of this, only one sixth is first-class crop soils.

In the middle 1930's the Belfast farmers recognized several problems: Slides and gullies; low crop yields; and inadequate income from livestock enterprises. Many improvements were needed in homes and in the community.

Figure 1. Most of the Belfast landscape is hilly.



R. J. Becker, associate professor of Farm Extension, Pennsylvania State University, University Park, Penna., emphasizes the inter-agency nature of the Belfast project. VPI, TVA, the CCC, AAA, PMA, and Soil Survey Division of USDA all cooperated, along with business men and farmers. A SCS group in the county now carries forward the work.

Community Development Project and Procedure

Land-use adjustment was a basic feature of the community development project the Belfast Mills farmers started in 1937. The farmers noticed the benefits of

adjusted land use on a unit test-demonstration farm in the community. They became interested when soils and land-use maps were made in the community, starting in 1935. In 1937, Lewis (5) stated, "The farmers were so much interested in the project that they formed the Belfast Mills Community Soil Conservation Association for the purpose of discussing community, soil, livestock, and land-use problems."

In 1936, a soil survey of Russell County (14), including Belfast, was made. Land-use and cover-quality maps of Belfast were prepared. Symbols were selected to indicate the type of cover, or other use of the land on each farm. These symbols also indicated certain cover conditions. In the mapping of pastures, the relative amount of the different plants in the pasture sod was estimated by close observation (5).

An extensive, detailed farm and home inventory was made in 1937 and each farmer was interviewed. The information included crop yields; numbers and grades of livestock; animal units per acre of pasture; farm equipment inventories, expenses and receipts; classifications of homes; inventories of home conveniences; debts; and property values.

Community conditions were studied. Schools, churches, social organizations, the serviceability of roads, and the extent of electric and telephone lines were catalogued. Markets where farmers bought supplies and sold their products were listed.

Successive inventories were taken and annual reports were made through 1942, with a summary that year reporting a five-year period (7, 8, 9, 10, 11, 12, 13). In 1947 a special study covering 1942-1947, was made (15).

In 1954, the Extension Service of Virginia Polytechnic Institute and the Division of Agricultural Relations of TVA commenced another follow-up study of Belfast Mills. This study was intended to determine *what* had actually happened to the community and land-use practices in the interim and, to some extent, *how* and *why*.

This 1954-55 study followed the pattern of the earlier work. All of the benchmark data were matched. Land-use and cover-quality maps were prepared for comparison. In addition to these, other kinds of information were gathered. Features of the community were considered with the assistance of professional agricultural workers and businessmen who knew the area. Two reports were made in 1956 on the 1954-55 study (1, 2). This paper, dealing with the land-use feature of the study, is based on these later reports in which the entire project was reviewed.

Land-Use Changes

A most important "conservation" change in Belfast Mills concerned improvement in land cover. The changes in crop acreages indicated how the farmers were attempting to use land within its capabilities, were adopting new and improved crops, and were changing the organizations of their farms. Acreages of grain crops had been reduced, and soil-conserving and soil-building sod crops such as alfalfa and legume and grass mixtures had been increased (Table 1). Trees had been planted to help control erosion. Men from a nearby CCC camp planted locusts on steep slopes and over gullied areas. Later these locusts furnished posts and poles. Other areas were let go back to trees. By 1954, forest lands had increased by 116 acres.

TABLE 1

Acreages of Crops on Farms in Belfast Mills, 1937 and 1954

Crop	*1937*	*1954*	*Change from 1937-1954*
Corn	705	475	−230
Small grain	544	326	−218
Tobacco	65	79	+ 14
Alfalfa	24	102	+ 78
Other legumes	106	91	− 15
Legume-grass mixture	70	104	+ 34
Grass meadow	467	470	+ 3
Garden	38	47	+ 9
Cane	3	4	+ 1
Truck	10	3	− 7
Total cropped acres	2,032	1,701	−331

In addition to reducing cropped acres by 12 per cent, the farmers changed the locations of many cropped fields in relation to the use capabilities of the soils. The soils maps provided guidance. The extent of this adjustment is reflected in the acreages of crops on soils classed as having pasture or forest-use capability. In 1937, there were 993 acre of crops on land classed as best suited to pasture and forest. By 1954, the cropping of these lands had been reduced to 43 acres.

Benefits

From these various land-use adjustments, the farmers realized certain benefits.

▶ *Soil erosion is no longer a problem in Belfast.* Three changes that contribute to this benefit are: The addition of 116 acres of forest; the better adaptation of land use capability; and the improvement of cover.

▶ Significant changes in land use included *a decrease in cultivated land and improved quality of legume and pasture lands.* Farmers in Belfast improved the quality of their pasture over the period of this study. This is reflected in the decrease from five acres of permanent pasture per animal unit to three and a quarter acres. The accurate cover maps of 1937 and 1954 gave a direct measure of the improvements in pasture quality. First and second class quality pastures had increased by 1,036 acres. Low quality pasture had been reduced by 821 acres.

▶ *Improvements in fertility resulted in increased yields.* Although crop acreages had been reduced, total production increased. Belfast farmers had significant success in increasing crop yields. Yields for some crops were not

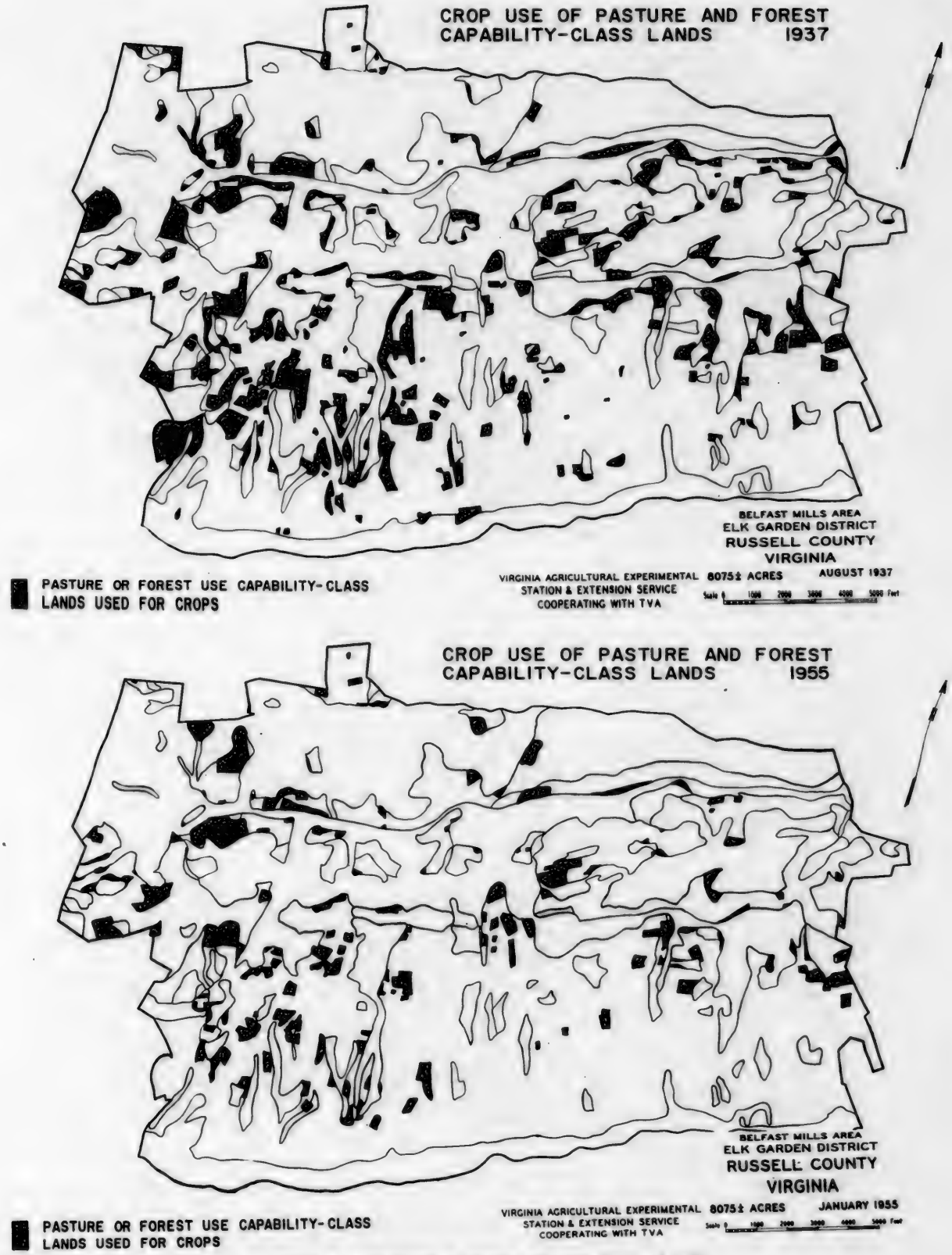


Figure 2. Comparison of certain land uses, 1937 and 1955.

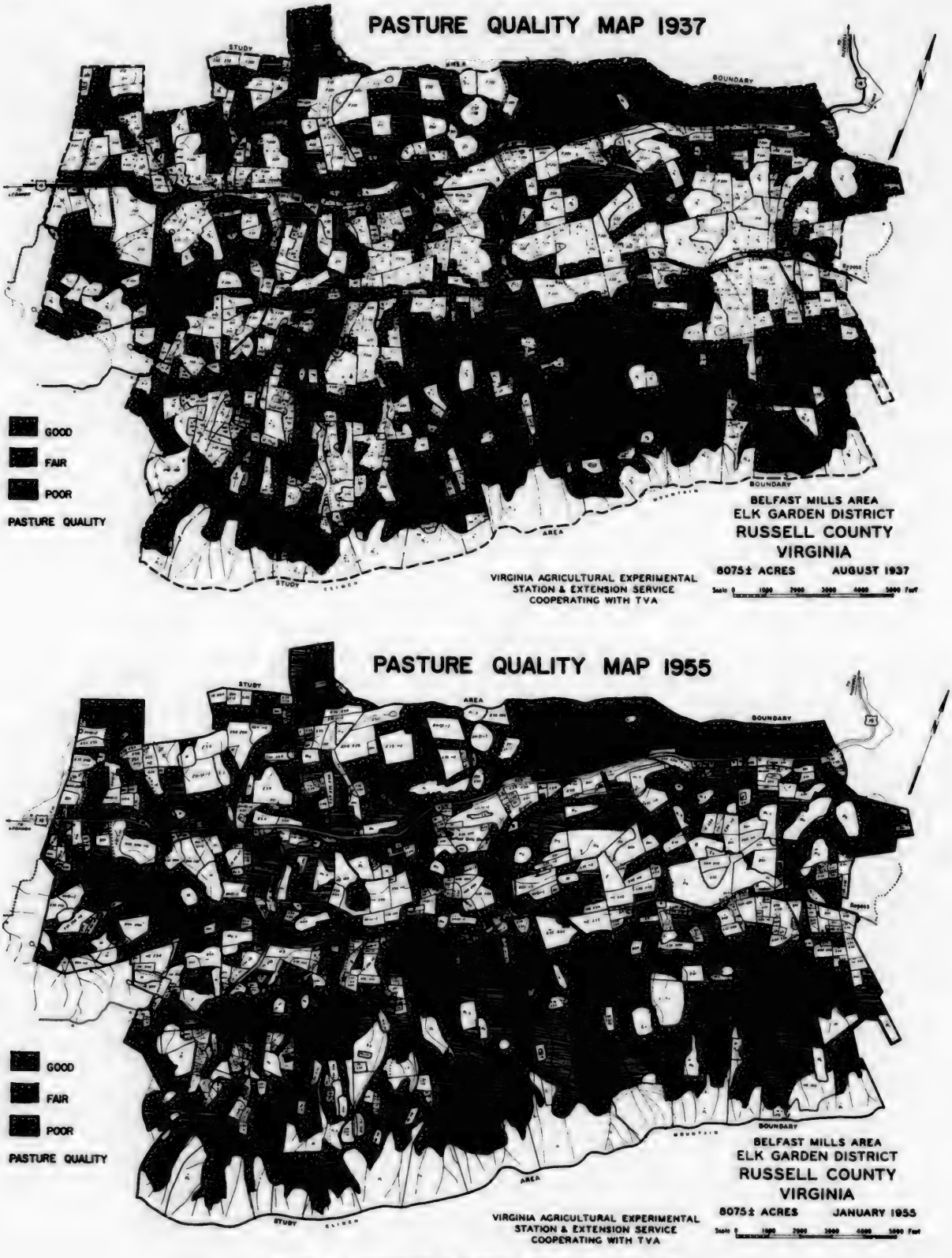


Figure 3. Comparison of pasture quality, 1937 and 1955.

reported for 1937. Also, alfalfa and some other meadow crops were new, later. Therefore, comparisons are made only of certain important cash and feed crops (Table 2).

TABLE 2
Yields of Important Feed and Cash Crops in Belfast Mills, 1937 and 1954

Crop	*Yield per Acre* 1937	1954	*Per Cent of Yield Increase*
Corn	34.4 Bu.	64.0 Bu.	86
Tobacco	1,200.0 Lbs.	2,153.0 Lbs.	79
Wheat	12.0 Bu.	28.0 Bu.	133
Oats	17.7 Bu.	44.0 Bu.	149

Yields of the important crops increased about 100 per cent between 1937 and 1954.

▶ *Changes in land use led to more feed production for livestock.* The number of animal units of livestock increased 58 per cent from 1937 to 1954.

Other Changes

The farmers of Belfast were using about three times as much machinery in 1954 as in 1937.

The changes made on the land were profitable and income from farming doubled. Cash farm income for each person on the farm in 1954 was 306 per cent of that of 1937. In terms of purchasing power per person, this was 51 per cent greater than in 1937.

Part of the income increase was used to improve farming. Also, the increased income meant a higher level of living in Belfast. This is reflected in the home equipment in use and a great increase in home conveniences.

Dwellings were rated on a basis of condition for the two years. The number of "good-class" dwellings increased from 22 to 25. The number in the "poor" class had been reduced from 23 to five. As compared with 29 in 1937, there were no buildings in the "E" class in 1954. All buildings were in use, with improvements general.

In 1954, eight children attended out-of-area schools other than high school. In 1937, there had been none. There were 32 in high school, from the area, in 1954, compared with 26 in 1937. In 1954, every home received a newspaper, compared with 54 per cent in 1937. Most received some magazines in 1954, and most had at least a small collection of books.

Changes of attitude and income in the community were demonstrated by other improvements. A grade "C" dairy route was established through the area in 1938. Farmers started building dairy herds and selling milk. Electric lines were rapidly added throughout the area. By 1947 all houses had electricity, compared with only 16 in 1937. Several miles of road were black-topped. For some time prior to 1937 the community had needed a new grade school building but no agreements could be reached among the people. The community development program meetings brought the people together, and during 1938 a new brick schoolhouse was built. Overdue repairs were made on the church and the grounds improved.

The Belfast farmers helped established two regional organizations in which they still participate: The Southwest Virginia Agricultural Association and the Southwest Virginia Cooperative. Both of these cover the same area —the eleven counties of southwest Virginia which are wholly or partly within the watershed of the Tennessee River. The SVAA, established in 1938, furnished an outlet for many educational activities. The Southwest Virginia Cooperative was set up in 1945 to handle farm supplies, especially fertilizers. It was the successor to the county and community soil conservation associations which had functioned in the first years of an Extension-TVA program. The "Co-op" is one of the major achievements of the farmers of southwest Virginia.

The future for Belfast is bright. Situations can now be identified which will bring further improvements. Experience has demonstrated that proper land use is a sound base on which to build further community development and improvement.

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Cover on Watershed Dams

M. D. ATKINS

Figure 1. The earth fill and spillway of a flood retardation dam after permanent grass was established by the seeding and mulching method described.

THE TREND toward accomplishing soil and water conservation and flood prevention through a watershed approach has resulted in the construction of many flood retardation and grade stabilization structures. The Soil Conservation Service has developed techniques and methods for establishing vegetation on these structures. The number of structures varies from only a few to as many as seventy-five in the small watersheds now in operation in the Great Plains states. The fill and spillways are of earthen construction. They are built with many kinds of soil material and are in areas of low and high rainfall. They present many difficult problems in establishing vegetation. The methods described here are those that were developed and are used in Kansas and western Oklahoma. The principles of establishment have wide application in surrounding states but the grasses and some of the cultural and management methods used must be selected to fit the conditions of each specific locality.

Importance of Mulch

When general construction is finished, a structure is bare of vegetation, the earth fill is smoothed and compacted, and the structure is immediately subject to severe water or wind erosion. Design of the earth fill may vary with the type of structure and with the soil material available but a common design provides a 3:1 front slope and 2:1 back slope. Short side slopes of the emergency spillway may exceed 2:1. Height of the earth fill itself is usually between 20 and 70 feet.

Upon completion of construction it is important to establish vegetative protection as soon as possible. Primary objectives are immediate protection of the structure and establishment of vegetation that will give permanent protection to the earth fill and spillway with a minimum of maintenance.

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How to Establish the Grass

This has been undertaken in several ways. In Oklahoma where bermudagrass can be used it is planted with sprigs and the structure is sprinkler-irrigated with water from the adjacent reservoir until the grass is established. Where bermudagrass cannot be used it has been necessary to develop a satisfactory seeding method for establishing permanent vegetation.

In Kansas efforts at seeding perennial grasses directly in the barren soil without a mulch have generally resulted in poor success. Infiltration is poor and the first rains bring about severe losses of soil, seed, and fertilizer. Attempts to use a companion crop such as wheat or oats with the seeding of grass have also given inconsistent results. Too often there has been insufficient moisture for both the grass and the companion crop. In still other instances the structure has been planted to an annual such as sudangrass or a small grain to give quick protec-

Figure 2. Flood retardation structure with construction just completed. Now ready to be seeded.

tion and then, following this crop, the perennial grass is planted in the stubble or residue. This method has resulted in fair success in a number of instances yet it has several disadvantages:

- The season when such a cover crop can be planted is relatively short.
- It will usually delay for a year establishment of a permanent grass.
- It is often necessary to mow the cover crop or otherwise remove the grain to prevent it from maturing seed that will provide competitive volunteer growth later.
- It necessitates two plantings—one for the cover crop and one for the permanent grass planting.

The most successful method has been to plant the permanent grass mixture and apply mulch at the same time. Several kinds of mulch have been used, depending to some extent on availability in the locality. Native prairie grass hay, bromegrass hay, small grain straw, and broomcorn stalks have been used in mulching structures in Kansas and Oklahoma. Native prairie hay has proven to be the most desirable because (1) it can be spread uniformly, (2) it deteriorates slowly, and (3) it provides no competitive volunteer growth and may occasionally contain some viable grass seed.

The amount of mulch that should be applied will vary some with the kind of material used and whether or not it is chopped. The objective is a uniform mulch of about one and one-half inch depth on the soil surface. For unchopped native prairie hay, about three tons per acre appears to be the maximum that can be applied without exceeding the desirable depth. Applications of two and of two and one-half tons have given good results. To avoid the laborious job of spreading the mulch by hand many contractors have developed mulch-spreading machines that do a good job. Most of these are modifications of field forage choppers with all or nearly all of the cutting knives removed. The outlet pipe from the blower revolves and is manually operated to spread uniformly the mulch material. The mulch must be anchored to hold it in place. Some attempts were made to anchor with an asphalt-emulsion sprayed into the mulch as it leaves the blower pipe on the mulch spreader. Results were not satisfactory. A better job is accomplished with a specially-build disk made up with a series of notched coulter disks spaced 12 inches apart. Some of these are tractor-mounted and some are not. On slopes where tractors can be operated they do an excellent job. They have been successfully used on 3:1 and 2:1 slopes. On some slopes it usually is necessary to hold the tractor on the slope with a chain or winch-line to another tractor or truck on the top of the earth fill.

Figure 3. Mulch-anchoring tool composed of a series of notched coulter disks. This tool must be heavily weighted.

Figure 4. A mulch-spreader made from a field forage chopper. Hay bales are fed into machine from tractor trailer or truck.

Just prior to applying the mulch a mixture of grasses adapted to that particular site should be planted. Fertilizer may be applied with the seed or just prior to seeding. The amount and kind of fertilizer that is applied will vary with the locality, the grass mixture used, and the type of soil material involved. Tame grasses will give a better response to fertilizers than will native grasses. In eastern Kansas 30 to 50 pounds of nitrogen (N) and about 40 pounds of phosphate (P_2O_5) per acre are applied. On structures in areas of less rainfall this rate may be reduced. The composition of the grass mixture will naturally be determined for each locality. It may be varied some with planting date. Structures may be completed and be ready for planting every month of the year. For protection of the structure it is desirable to seed and mulch soon after construction is complete. It is desirable that the mixture contain some grasses that will germinate quickly and provide some initial protective growth but basically it should include several of the climax dominant native grasses of that area. In Kansas the native grasses that make up an important part of the seed mixture are western wheatgrass, commercial "mixed bluestem," switchgrass, sideoats grama, blue grama, and buffalograss. Smooth brome, tall fescue, or intermediate wheatgrass are included in the mixture to provide initial, though less permanent, protection. Recognizing the difficulties of seeding on these sites and that planting may not be done on the optimum date, a wide mixture made up of five to eight grasses is usually used and the seeding rate is stepped up to 30 or 40 pounds per acre. Planting with a grass drill has given better results than broadcasting although mulching makes up in part for the shortcomings of broadcasting methods of seeding.

Maintenance

The mulching and seeding methods now being used go a long way toward minimizing the problems of establishing and maintaining permanent protective vegetation on these structures. It has not solved all the problems. Establishing vegetation on these unnatural sites is particularly difficult on slopes steeper than 3:1. If these steep slopes have a south or west exposure (the "hot-side" of the structure) the condition is further aggravated. Often methods of seeding that give good grass stands on a 3:1 slope or on north and east exposure fail to give satisfactory results on 2:1 slopes or south and west exposures. The more difficult the site the more difficult will be the establishment and maintenance of vegetation.

Livestock must be excluded from the structure until vegetation is well established. When the grass is established, moderate grazing use may be possible on some structures. Where bermudagrass, smooth brome, or other tame grasses are used, and it is the intention to maintain them as long as possible, an annual program of maintenance must be followed including moderate grazing or mowing and fertilizing.

Summary

The method developed and presently used for mulching and seeding of watershed structures goes far toward accomplishing the objectives of immediate protection and the development of a permanent vegetative cover. The mulch provides immediate protection from erosion, improves infiltration, provides conditions on the soil surface favorable for grass seed germination and seedling growth over an extended period. The use of native grasses of known local adaptation as an important part of the grass mixture will reduce the problems of maintenance. Such grasses will also more nearly assure a permanent vegetative cover for these structures which are an important part of the total land treatment and flood control job on a small watershed.

Figure 5. Front side, a 3:1 slope, of a flood retardation structure after the seeding and mulching job was completed.

Effects of 1957 Storms on Oklahoma Watersheds

RAY WALKER

The months of April, May and June of 1957 in Oklahoma were frightening, costly ones for many thousands of Oklahomans.

Never in Oklahoma's weather history had so much water fallen in so short a time. Never had its streams risen to such violent crests and spread so far over bottomlands.

Weather people called the experience a 75 to 100-year frequency storm condition. The patterns varied widely. Some of the flooding was caused by large frontal storms, like the one which passed over a broad area of north central and northeast Oklahoma on May 15 and 16.

This storm had a center which dumped 20 inches of rain near Hennessey.

Other areas were visited by floods caused by recurring small storms. Such storms ordinarily would cause only minor damage. But coming one after another as they did, they spread heavy local destruction.

There were the combinations of both large and small storms like the one which on June 12 left 20 inches of rainfall in the Bartlesville-Tulsa area. All bottomlands were flooded by this storm.

Along Oklahoma's tributaries are aproximately 3,040,000 acres of bottomlands that are subject to flooding. More than 2,550,000 acres of this were flooded at least once during the 1957 spring. A large portion was flooded repeatedly.

Rainfall of such intensity and such widespread and prolonged flooding can be expected to cause rapid and most damaging erosion. Sheet and gully erosion in many areas, of course, was great.

However, millions of acres of crop and range lands escaped with relatively light damage or with no apparent erosion at all. There were two reasons for this happy circumstance. *Good growing conditions in the few spring weeks before the storms had produced excellent cover over broad areas of cultivated croplands, pasture and rangelands. Weeds and perennials grew rapidly.*

The second reason for the comparatively light erosion cost was *the work of Oklahoma's farmers and ranchers who had prepared for such emergency with their soil and water conservation efforts.* Sixty per cent of Oklahoma's agricultural lands is covered by Soil Conservation District plans. Approximately 55 per cent of these plans had been applied.

In areas where cultivated fields were without cover or terraces, erosion was severe. Three million acres of clean-tilled croplands were the source of millions of tons of reservoir and stream-clogging sediment. Severe gully erosion was mainly restricted to raw, active gullies, to areas of sparse vegetation and to unprotected roadsides.

There was little runoff in the early days of the storms as the drought-punished soils drank deeply. As the storms continued, the soils became saturated and runoff in-

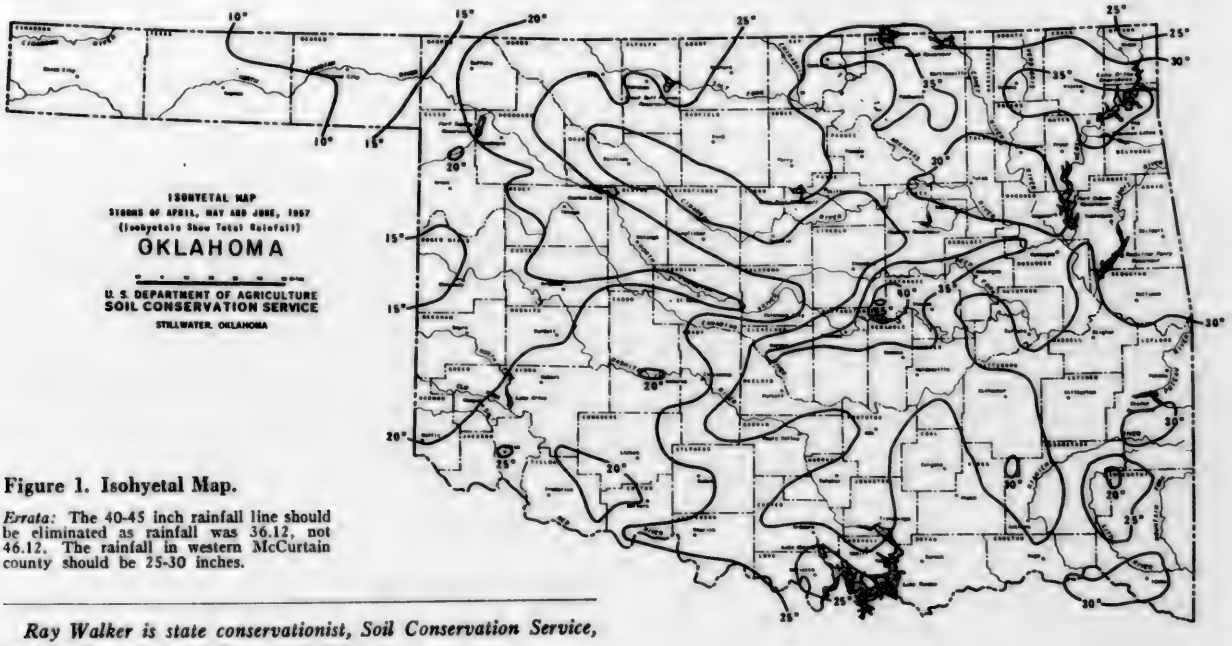

Figure 1. Isohyetal Map.

Errata: The 40-45 inch rainfall line should be eliminated as rainfall was 36.12, not 46.12. The rainfall in western McCurtain county should be 25-30 inches.

Ray Walker is state conservationist, Soil Conservation Service, with headquarters at Stillwater, Oklahoma.

Figure 2. Severe channel cutting in the Washita River knocked out an average of 200 feet of rich bottomlands along one ten-mile stretch. Damages to crops in the Garvin and Murray Soil Conservation Districts were estimated at $1,300,000.

creased. At this point, however, sheet erosion seemed to diminish as the water filled the soil and covered the surface.

Before the storms, high yields of grain had been in prospect. Because of intermittent rainfall, the wheat, oats, rye, vetch and barley could not mature properly. Vetch died before the blossoming stage in many areas. Oats and barley had a tendency to lodge, making harvest difficult or impossible. The wheat that could be harvested—usually with great difficulty and by the ingenious use of equipment—had a test of only 32 to 54 pounds to the bushel. A test of 60 pounds is standard.

The continuing rains delayed the planting of row crops. Creek tributaries flooded so frequently that water gaps and fences could not be repaired between floods. This kept farmers from turning livestock back into bottomland pastures. At least 45 days' grazing were lost in the eastern half of the state.

Overbank deposition of sediment occurred over most of the flood plains, but only 10.6 per cent of these areas was much damaged. Most of this was in the south central part of Oklahoma.

Scour damage or erosion occurred on flood plain lands, chiefly in the north central and east central parts of the state. Deep flooding seemed to be the chief factor in this type of damage.

More than 7,000 acres of bottomland were destroyed by streambank cutting.

Sediment damage to roads, road ditches and bridges was serious and expensive. Central and eastern sections of the state bore the brunt of this. Deposition up to four feet in depth blocked some roads.

Sediment deposition also was severe in many towns, amounting to an estimated total of $3,126,000.

Farmers counted their greatest losses in damage to crops and pastures. Floodwater depths ranged up to 10 feet on some fields. Loss of yields, cost of replanting and loss of perennial stands—these were heavy blows to farm pocketbooks. They totaled $37,530,000. Non-agricultural damages, including urban property, roads and bridges, accounted for another $10,330,000.

Counting indirect damages—such as the inability of owners to use pastures or to reach the market with products—the total damages resulting from the storms and flooding were estimated at $67,191,000.

The storm period gave Oklahomans and the rest of the nation a chance to see upstream flood prevention in its severest test.

The work of flood prevention and watershed protection has been making fast progress in Oklahoma. The Washita River was one of the 11 projects authorized by Congress for flood prevention work by the Soil Conservation Service in 1944.

During the storm, 149 floodwater retarding structures —the medium-sized dams which, with land treatment, are the core of the upstream program—were in operation in Oklahoma. Of these, 143 are on the Washita. Six are on Double Creek, a pilot watershed project, one of 60-odd such projects authorized in 1953 as "showcase" examples of this work.

The floodwater retarding structures were designed to retard and discharge automatically three inches of runoff in western Oklahoma and up to 4½ inches in eastern Oklahoma.

The 149 structures held back and released in an orderly fashion more than 108,000 acre feet of runoff. Seventeen of the structures filled above their capacity, causing flow through their vegetated emergency spillways.

The floodwater retarding structures are in nine watersheds, with half of the area of each watershed draining into them. They protected 32,232 acres of flood plain lands.

Each watershed took the battering of one or more

storms. As a result of the protection by the structures and the land treatment above them, no flooding occurred on Sergeant Major, Beaver, Barnitz or Pennington Creeks. Slight flooding occurred on Sandstone, Wayne and Chigley Sandy Creeks. More flooding took place on Owl and Double Creeks, but during several of the storms flooding was prevented.

Benefits from the flood prevention work on these small watersheds was estimated at $831,000 during the storms. If the same kind of protection had been given to all Oklahoma watersheds, such benefits would have amounted to more than $47,000,000. This does not include the increased income to farmers made possible by higher revenue-producing crops on bottomlands safe from extensive flooding.

As the storms straddled treated and untreated small watersheds, Oklahoma had a chance to make interesting comparisons. There was Sandstone Creek, with little damage, and Upper Elk Creek alongside and far out of banks. There were Barnitz Creek, with its 54 floodwater retarding structures, and Beaver Creek struggling with its torrent across the ridge.

On Chigley Sandy which drains 29,349 acres and has 3,354 acres of protected flood plain, rainfall in five storms varied from 2½ inches to nine inches. Damages amounted to $4,634. Residents said they would have been flooded four times. Nearby Kickapoo Sandy, in the same storms, raged out of banks three times, rolling up $120,000 damages to crops, pasture, fences, levees, drainage systems, county roads and bridges and to scour. U. S. Highway 77, a main north-south artery, was closed twice.

Smaller storms will be coming to Oklahoma's watersheds year by year. They won't make the headlines, as did the storms of 1957, but nonetheless they will have the capacity for costly damage on Oklahoma's creeks and small tributaries. Present swift progress on upstream work, in the systems of floodwater retarding dams and the land treatment measures, will lessen the impact of floods on our agricultural plant and, to that extent, the damages to our economy in Oklahoma will grow ever less. This kind of protection on all our streams is our goal.

Figure 3 *(above)*. About 2,000 acres of Washita River farm bottomlands were destroyed in April and May 1957. Gas line being undercut must be replaced.

Figure 4 *(below)*. U. S. Highway 77 and bridges took a severe beating. Upland watershed and flood-protection treatments can at least lessen the impact of floods on many creeks.

Flood Damage Evaluation on Honey Creek, Texas

LELAND H. BARNES

Evaluations of small watershed improvements continue. Here are a few details of performance of flood prevention and soil-saving structures and practices after having been subjected to severe storms. The author, L. H. Barnes, is an Hydraulic Engineer, SCS, Fort Worth, Texas. A detailed map, with colored legend, was submitted, but not reproduced. On this map were shown the areas of floodplain on which structures and practices reduced damages. Honey Creek is a part of the East Fork Above Lavon watershed, which in turn is part of the Trinity River watershed north of Dallas and Fort Worth, Texas.

The East Fork above Lavon watershed has a drainage area of 224,935 acres (351 square miles), which includes 4,125 acres in Lavon Reservoir area above elevation 480 mean sea level. Approximately 209,330 acres are in farms, with the remainder in urban areas, roads, highways, Lavon Reservoir, stream channels, and other miscellaneous uses.

An estimated 69 per cent of the watershed is being used for crop production. Cotton, corn and small grain are the principal crops grown. There are approximately 16,000 acres of bottom land in the watershed, of which 14,600 acres are flood plain and 1,360 acres are in stream channels.

East Fork went far over its banks several times during April and May, 1957, and caused extensive damages. Honey Creek with a partial flood prevention program suffered only minor flooding and little damage.

Honey Creek, one of the principal tributaries of the East Fork, has a drainage area of 33,856 acres (52.9 square miles). Very severe storms occurred over the entire watershed during April and May, 1957. The weighted precipitation over the watershed was 30 inches during April and May as compared to a 28-year average of 9.7 inches. Four high-intensity storms which produced excessive precipitation occurred during this period, as follows: 5.46 inches during the week ending April 22; 7.15 inches during the week ending April 30; 3.39 inches during the week ending May 14; and 10.47 inches during the week ending May 27. These four storms produced 26.5 inches of rainfall, or 88 per cent of the total.

Soil and cover conditions were very poor as a result of an extended drought. These conditions caused very high rates of erosion and runoff.

Figure 1. Honey Creek Watershed—weighted rainfall by weeks for the period, April 15 to May 27, 1957.

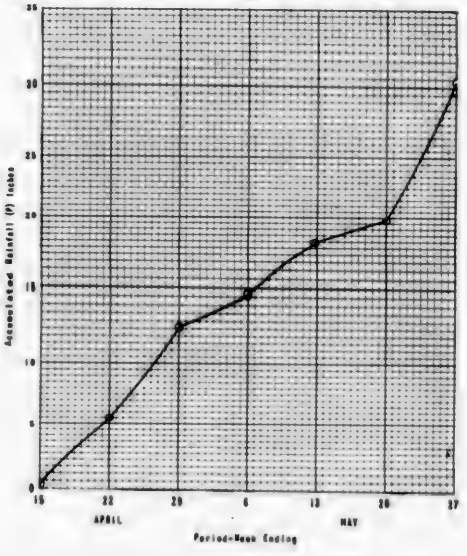

Figure 2. THIS . . .?
Bottomlands of the East Fork flooded eight hours after four to five inches of rain fell over the watershed.

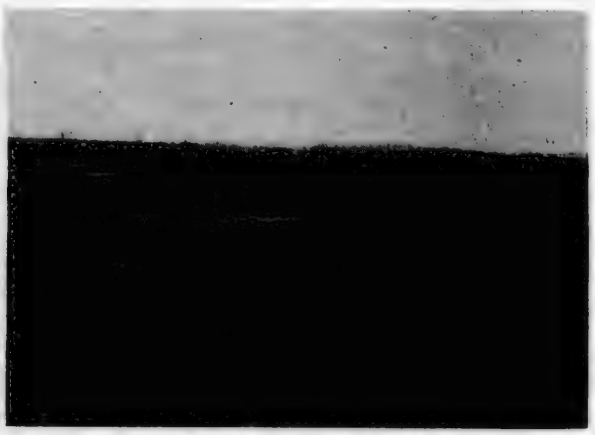

Figure 3. . . . OR THIS?
Bottomland along Honey Creek can be protected if watershed is adequately furnished with flood-prevention structures and practices.

On April 19, when excessive precipitation began, 14 of the 17 planned floodwater retarding structures on Honey Creek had been completed. The detention storage capacity of the 14 structures is 6,981 acre-feet. All the pools filled one to two times and partially filled several times during April and May. They held back temporarily and released about 20,500 acre-feet of floodwater at non-damaging rates.

The 14 structures and applied land treatment measures reduced the floodwater and sediment damages in the Honey Creek flood plain from $73,150 to $15,730—a benefit of $57,420.

If all the land treatment measures and planned floodwater retarding structures in the East Fork above Lavon had been installed, they would have prevented over $600,000 of floodwater and sedimentation damages in the watershed.

Studies on Honey Creek showed that about 200 acre-feet of sediment were deposited in the 14 structure pools during the April and May storms. This is equivalent to 8.3 acre-feet per square mile, or an average of 0.15 inch of soil loss over the entire watershed.

It is estimated that 75 per cent, or 150 acre-feet of the deposited sediment in the 14 structures would have been delivered to Lavon Reservoir. These structures reduced the sedimentation damages to the reservoir by about $6,450. (This is based on a cost of $43 per acre-foot of storage in the reservoir.)

In addition, the 14 structures prevented sedimentation damages of about $3,500 to the flood plain of Honey Creek.

Had all the structures in the East Fork above Lavon been installed, they would have prevented approximately $40,000 in damages to the reservoir as a result of reduced sedimentation.

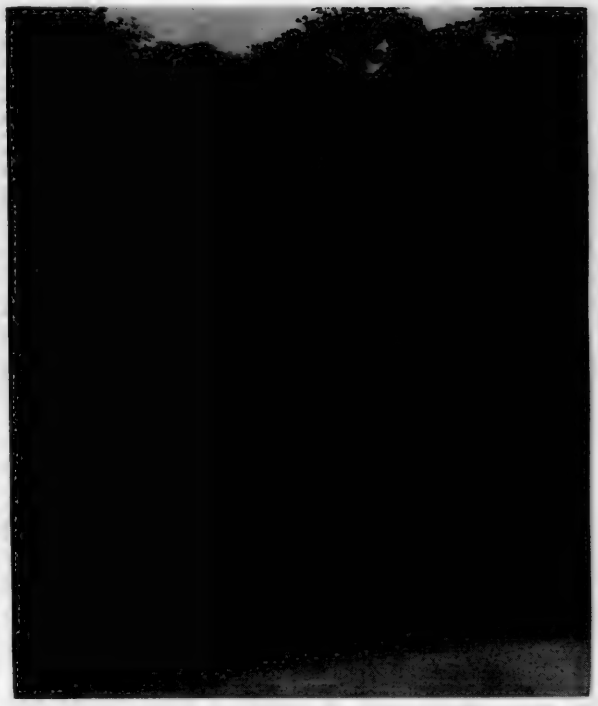

Figure 4. Orderly flow of Honey Creek shown from concrete bridge which local residents say would have been destroyed during the April rains had it not been for flood-prevention measures.

If 80 per cent of the planned land treatment measures had been applied on the remaining area, an additional $28,000 in damages to the reservoir would have been prevented.

Had all the planned structures in the East Fork above Lavon Reservoir been installed, an additional $15,000 of flood plain sedimentation damages would have been prevented.

Figure 5. Detention reservoir, East Fork Above Lavon Site 9, can hold 412 acre-feet of water coming off a detention area of 855 acres. Pools such as this held back temporarily and released over 20,000 acre-feet of floodwater at non-damaging rates during the 1957 storms.

Woodland Conservation in an Agricultural State

W. G. STUMP

IOWA, "The Tall Corn State", has also been called "The Nation's Magic Garden". Agricultural products won this state national recognition. The ready availability of straw resulted in the Hinde and Dauch Company establishing a straw board mill in 1921 on the banks of the Mississippi at Fort Madison, Iowa.

Throughout the years little attention was given to the forest resources. Land was cleared for crops, timberland was grazed, and oftentimes the timber was clear cut with no thought for the future or highest land use. People were more interested in the agricultural crops and livestock they could produce on the farm.

The passing of time brought many changes. Farming practices on some of the rolling land along the Mississippi were not the best, and part of this land reverted to pasture or was abandoned. Changes in crops and methods of harvesting reduced the amount of straw available for paper manufacture. In 1955 the paper mill closed.

The management of Crandon Paper Mills, Inc. looked at these neglected forest resources. They felt that with good forest management and land use, there would be a sufficient volume of wood to support a paper mill using wood instead of straw.

In September 1955 Crandon purchased the idle straw mill and spent approximately $2,000,000 to renovate, modernize, and convert the plant from a straw mill to a wood mill producing approximately 135 tons of paper a day. Operation of the plant at this capacity would provide an approximate $750,000-a-year pulpwood market for the woodland owners within trucking distance of the mill.

In the area in which the company would be buying wood, were well established state farm forestry programs with local farm foresters giving technical assistance to woodland owners. The work these men were doing and their knowledge of local conditions would be very helpful to the company in promoting their forestry program.

To work together effectively it was necessary that the company and public foresters understand each other's objectives and problems. A mutual understanding was reached on the forest management and utilization program needed to build up the forest resources of the area and at the same time assure the company of an ample wood supply.

Mr. Joseph L. Gidwitz, president of Crandon is a firm believer in good forestry practices and the need to promote good forestry. He has met with agricultural leaders and woodland owners to discuss forestry and wood procurement problems. A paper mill is a long term investment which must be protected by a permanent wood supply. In this predominantly agricultural area, wise

Figure 1. Farm woodlands within economical trucking distance of the Crandon Mills can be worked profitably, provided there is good management.

Figure 2 *(below)*. The Crandon Mills at Fort Madison has the capacity to provide annually a $750,000 pulpwood market for nearby Iowa farm-woodland owners.

W. G. Stump is Utilization and Marketing Specialist with the U. S. Forest Service, Milwaukee, Wisconsin.

land use and good forest management practices are a "must" if the mill is to be kept in operation.

Mr. Gidwitz recognized the need for providing forestry assistance to woodland owners. To insure this objective a separate organization known as Crandon Forest Farms was established under the direction of Carl Langenbach, woodlands manager for Crandon Paper Mills. Assisting him in this work are two former state farm foresters, Gordon White from Illinois and Allan Allyn from Iowa.

Crandon Forest Farms has been established to provide without charge these services:

- Prepare forest management plans for the woodland owners.
- Upon request, advise owners concerning proper timber harvesting practices and the most advantageous time for harvesting trees.
- Designate specific trees on owner's tree farm for harvesting, thereby enabling the owner to realize maximum returns from his tree farm, both now and in the future.
- Advise owners concerning the planting of barren land to trees.
- Provide a planting machine for owner's use.
- Purchase pulpwood needed by Crandon which is ready to harvest from owner's tree farm at the prevailing prices of Crandon Paper Mills, Inc.

During the terms of this service agreement, the owner will: (1) Give Crandon the right to assist him in managing his tree farm; (2) Give Crandon first right to purchase farm timber. If Crandon and owner cannot agree as to terms, owner may sell the farm timber to others; (3) Give the tree farm adequate protection from fire and livestock grazing; and (4) If owner decides to sell, give Crandon first right to buy the owner's land. If Crandon and the owner cannot agree as to terms, owner may sell the land to others.

Crandon Mills promotes good forest management and wise land use in still another way, by "practicing what they preach". To date they have purchased about 2,500 acres of poorly stocked timberland or abandoned farm land in the vicinity of the mill to rehabilitate or plant. In the spring of 1957 approximately 120,000 trees were planted on Crandon owned land. These company-owned lands will be used as special areas demonstrating good land use and forest management.

In January 1957 a new pulpwood policy was announced. Hereafter, the company will pay a premium of 50 cents per ton for pulpwood harvested from woodlots that are managed according to good forest management practices. This policy is designed to encourage woodland owners to make the most efficient use of their woodlots and to give more consideration to harvesting *future* crops of trees from the same land.

Langenbach has said their goal is to encourage farmers of this region to think of trees as a crop. That's exactly what they are, now that Crandon has created a steady market for pulpwood. Of course, trees take longer to mature, but much of the marginal land in this area would produce more and steadier income if devoted to tree farming rather than crops. This is not to mention other benefits of tree farming such as soil and water conservation, the preservation of hunting and wildlife refuges.

Removing larger and older trees, first, makes room for intermediate trees to take their place. These will then grow faster and soon reach harvesting size. Smaller trees take their place and the process continues indefinitely and provides the land owner with successive cuts of merchantable timber.

To cut all the trees at once makes the land useless for wood production for forty years. In the average timber stand, the volume of wood in the smaller trees is less than

Figure 3. The youths of Iowa can become involved in vigorous small woodland management programs and many acres of rolling lands in Iowa can be placed in a more fitting level of capability use—provided there is leadership and cooperation.

half the total. If allowed to grow for five years, these smaller trees will double their present weight and then replace the volume removed. Yet, we often find timber cutters foolishly cutting their future crop of young trees. This is simply trading tomorrow's dollars for today's nickels.

When Mr. Langenbach suggests they think five years ahead, they often ask, "Where will I be five years from now?" The answer to this is to look where we were five years ago. We quickly realize that it wasn't so long ago.

The job for Crandon foresters is to assist land owners and timber harvesters with their problem in any way they can. The services are free with no strings attached. A land owner may take their suggestions or ignore them. Foresters do urge land owners to contact them before any cutting is done. Too often an owner sells his trees first and turns to them for help after his stand has already been damaged by unwise cutting.

Mr. Langenbach commented that, "Owners who feel they may get a biased report from a forester employed by one particular industry or company are encouraged to talk to their own state employed farm forester. Good forestry is good business for all of us. Whether administered by a state forester or ourselves, crops of trees will provide valuable additional income to farmers of this region" and will place many acres of land into a more fitting level of capability. This is one challenge of utilization of wood products in an agricultural state.

Eagle Rocks Prong

BERNARD FRANK

The more complete story of "Return to Eagle Rocks Prong" is carried in *The Living Wilderness* Autumn, 1957. The author waited 15 years before he was finally able to make the tortuous trip up the creek called Eagle Rocks Prong in the Great Smoky Mountains National Park.

This excerpt of adventure, philosophy, and observations, is offered in view of anticipated visits to the Great Smoky Mountains National Park by many of the conferees who will be attending the SCSA meeting in Asheville, N. C., October 19-22. Perhaps it might lead some to penetrate on foot a few hundred feet into the wilderness of the Smokies during their Southern trip.

THE [Tennessee] wilderness in which we hiked and its counterpart on the [North] Carolina side have many riches in basic knowledge that only assiduous, repeated observation and close study can unearth. Here the forces of climate and geology, and the soils with their flora and fauna that have developed under the play of these forces, function without interference from human activity. Here is a paradise for the biological researcher willing to carry on his or her pursuits without benefit of roads or dug trails. Yet this unique area still does not suffice to cover the full range of environmental processes and relationships that makes the Great Smoky Mountains National Park so valuable a wilderness laboratory. Hence to attain more complete and representative coverage, additional drainage areas in this still largely primeval park need also to be dedicated to wilderness research. The gain in basic biological knowledge alone will be well worth the "sacrifice" to intensive recreational use that the continued non-development of such research reserves entails. The gains in terms of providing a better foundation for managing the millions of acres of forest land throughout the Southern Appalachians and Piedmont, not only for timber but for fish, wildlife, and recreation, would make the benefits of such research even greater.

REFLECTING on our mutual outdoor experiences, Harvey Broom and I later discussed the impact of grueling effort on the human organism. For hour upon hour the body remains under continual physical and mental tension. Every step must be calculated to avoid disabling injury. Yet, to the trained person in good physical condition, even if middle-aged, these stresses are taken in stride. Hidden reserves of energy are constantly available on demand. A few moments' rest suffice the furiously pounding heart to moderate its pace and the strained muscles to regain their resiliency. The intake of small amounts of proteins and carbohydrates—plus an occasional sip of water—restore depleted tissues and used up sugars in amazingly short order. Unquestionably man's muscles, glands, brain, and those intangible characteristics we call mind and spirit are well geared to withstand, even thrive under, long periods of sustained hardship and exertion. How else could man have surmounted the innumberable difficulties he has had to contend with in the course of his development as a species?

There are many ways in which we can maintain the tone and vigor of our splendid biological equipment and build inner strength. Wilderness experience is but one outlet, and if not equally open to all, is nevertheless available to a surprisingly large number once they have learned to appreciate its requirements. And its challenges are solid enough, and its after-effects sufficiently refreshing and lasting, to place it among the finest means of maintaining virility of mind and body. That is reason enough why, as Sig Olson has so well said, "We need wilderness."

An Inexpensive Rain Gage

S. J. URSIC AND J. L. THAMES

HERE IS described an easily constructed rain gage that has proved to be an accurate supplement to standard U. S. Weather Bureau gages for making estimates of areal precipitation.

Standard Weather Bureau gages are expensive. Hamilton *et al.* (1) reduced the cost of standard gages by eliminating the inner brass measuring tube and measuring the catch in a lucite graduate which they designed to read directly in inches. Huff (2) tested four types of low-cost small-orifice gages and found them to compare favorably with a U. S. Weather Bureau standard 8-inch gage. Berry and Berg (3) ingeniously substituted No. 10 cans for standard rain gages. They used aluminum foil for the funnel and measured amounts in a lucite graduate similar to the one described by Hamilton.

The No. 10 can gages seemed ideally suited for increasing the networks of gages needed for studies of small watersheds, soil moisture, and interception at the Tallahatchie Research Center, in north Mississippi. A considerable number were made up at a cost of a few cents each.

The No. 10 cans, readily available from restaurants, have a six-inch inside diameter and stand seven inches high. Used cans are preferable to new cans because of the additional strengthening cap rim remaining after the top is removed. A funnel was formed by cutting along the radius of a 7¼-inch disc of galvanized sheet metal and overlapping the cut ends 3¾ inches. Four sheet-metal screws supported the funnel so that its top edge was 1½ inches below the rim of the can. The cans were painted and mounted on discarded ¾-inch electrical conduit. Short lengths of one-inch pipe crimped on one end and soldered to the can provided a convenient attachment. These details are illustrated in Figure 1.

To test the catch efficiency, eight No. 10 can gages were installed on an obstruction-free level area in a cross arrangement with a U. S. Weather Bureau standard 8-inch gage in the center (Figure 2). The gages were placed three feet apart with the tops at the same height as the standard gage. A second standard gage, nine feet from the first, was added later.

Sixty-three storms, ranging from 0.01 inch to 4.80 inches and totaling over 43 inches, were measured over a nine-month period—April-December 1957. The second standard gage was in operation for the last 43 storms. All precipitation was rain.

The authors are members of the Tallahatchie Research Center, which is maintained at Oxford, Mississippi, by the Southern Forest Experiment Station, Forest Service, U. S. Department of Agriculture, in cooperation with the University of Mississippi.

Rainfall in the standard gages was measured to 0.01 inch with a dip-stick. Precipitation in the No. 10 cans was measured to one cubic centimeter in a 500-milliliter graduate and converted to inches (reading in cubic centimeters multiplied by 0.002158).

Catch efficiency of the No. 10 can gages was based upon compatibility with the centrally located standard gage. Two-thirds of the more than 500 individual measurements were either equal to or within plus or minus 0.01 inch of the rainfall measured in the standard gage. No one "can" consistently measured higher or lower than the standard gage. Mean differences for the 63 storms for the eight cans ranged from 0.013 to 0.016 inch and averaged 0.014 inch. Deviations from the total rainfall of 43.28 inches varied from a minus 0.48 inch to a plus 0.23 inch and averaged 0.20 inch. By way of comparison, the mean difference between the two standard gages for 43 storms was 0.006 inch and the total deviation a plus 0.10 inch.

Rainfall amounts measured among the No. 10 cans were surprisingly consistent, especially for storms for which these amounts varied most from the rainfall as measured in the standard rain gage. If it can be assumed

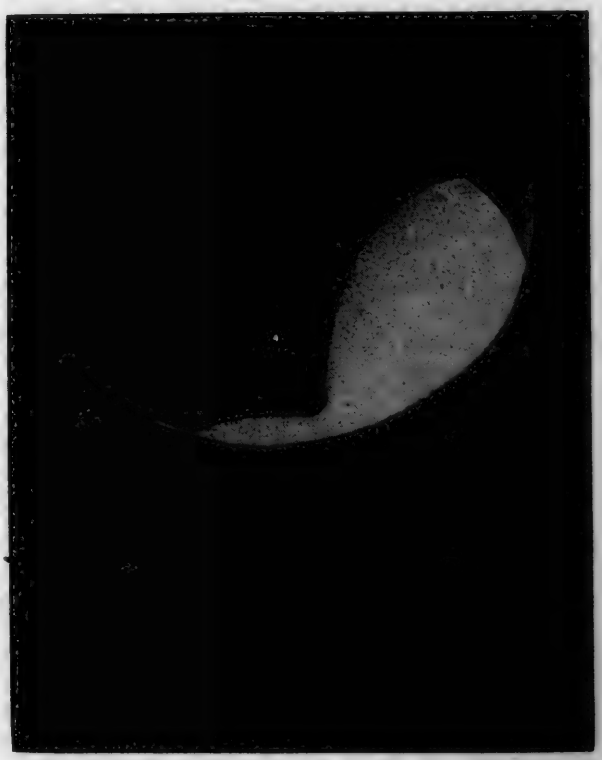

Figure 1. Construction details of a No. 10 can rain gage.

that the absolute measure of precipitation for each storm was an average of all ten gages, the mean differences of the central standard gage, the second standard gage, and the No. 10 can with the greatest departure are respectively 0.011, 0.013, and 0.016 inch. The total of the averages of all gages was 0.06 inch less than the total measured at the centrally located standard gage.

Obviously, the No. 10 cans are satisfactory for all practical purposes. Differences were probably due to variations in rainfall, local eddies resulting from the study layout, errors in measurement, or to apparent differences resulting from numbers rounded.

The plus 2 per cent error resulting from the measuring stick displacing water when introduced into the measuring tube of the standard gages was not considered.

In small watershed studies at the Tallahatchie Research Center, storm amounts measured in standard U. S. Weather Bureau gages sometimes vary 0.10 inch or more within a ¼-mile radius. Supplementing the standard gages with the No. 10 cans has greatly improved the accuracy of areal rainfall measurements.

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Figure 2. Test layout to compare No. 10 can gages and a U. S. Weather Bureau standard 8-inch rain gage.

Occurrence and Depth of Frozen Soil

ROGER R. BAY

Roger Bay is a research forester at the Grand Rapids, Minnesota, field center of the Lake States Forest Experiment Station. The Station is maintained at St. Paul 1, Minnesota, by the Forest Service, U. S. Department of Agriculture, in cooperation with the University of Minnesota.

The evidence indicates that concretely frozen soils are practically impermeable to the passage of water. The presence and depth of concrete frost is, therefore, an indication of spring flood producing areas. The type of forest growing on an area is one factor influencing the formation of frost. In this study, soil freezing was compared on four different cover conditions typical of northern Minnesota.

Soil freezing is an important factor affecting the rate of spring runoff. When soil freezes, its ability to absorb water from melting snow or early spring rains is seriously impaired. Since all forest soils do not freeze in the same manner, a study was made to determine the type and extent of ground freezing under several of the major forest types in northern Minnesota during the winter of 1956-57. This paper presents some preliminary results on one type of frost.

The following conditions, found on loamy to fine sandy loam soils, were studied on the Pike Bay Experimental Forest near Cass Lake, Minnesota.

White pine-hardwood—Stand age ranges from 40 to 150 years with an average basal area (cross-sectional area of tree stems at breast height) of 168 square feet per acre. The stand is undisturbed except for a series of light improvement cuts which removed over-mature hardwoods and reduced the hardwood component to 48 square feet of basal area per acre.

Aspen—Age of this stand, established after the original forest was logged, is approximately 34 years, and the basal area ranges from 60 to 100 square feet per acre.

Balsam fir—This stand is composed of balsam fir, white spruce, and scattered, over-mature aspen and large white pine. Stand age is about 60 years and basal area of all species is 134 square feet per acre.

Open area—This is a grassy opening in the forest, which was cleared for a logging campsite many years ago.

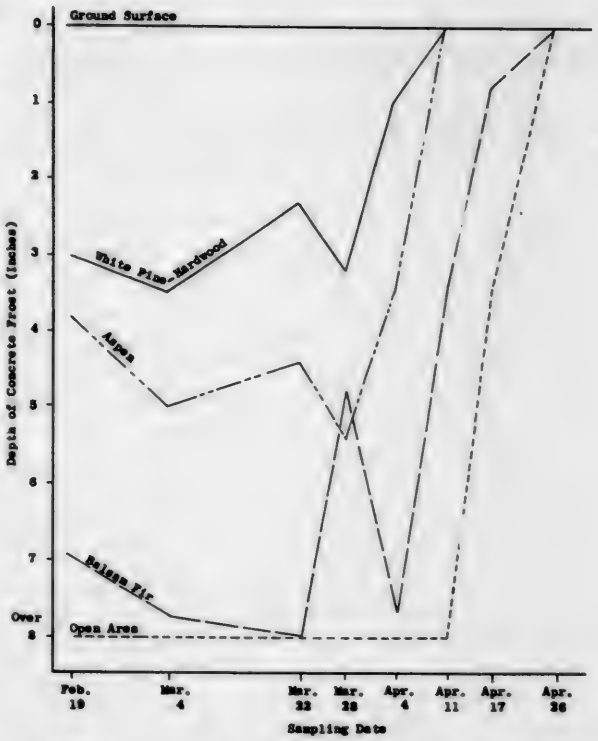
Observations on the type and depth of frost were made periodically beginning February 19 and ending April 26 when all snow and frost had disappeared. At each sampling date ten observations were made in each cover condition. Frost was classified in the same general manner as discussed by F. A. Post and F. R. Dreibelbis. (*Some influences of frost penetration and microclimate on the water relationships of woodland, pasture, and cultivated soils*. Soil Sci. Soc. Amer. Proc. 7: 95-104. 1942.) Four general types were recognized—*concrete, granular, honey-comb,* and *stalactite*—but discussion in this note is confined to the concrete type, which has the greatest effect on runoff. Concrete frost is characterized by frozen ice crystals, which cement soil particles together into a dense "concrete-like" mass. Passage of water through this type of frost is greatly restricted. The other types of frost are more or less porous, and water movement into and through the soil is less inhibited.

Frost depth and occurrence varied considerably on all areas. Concrete frost was deepest and occurred at the greatest number of sampling points in the open area (see Table). Next in order were the balsam fir stand and then the aspen stand. The white pine-hardwood stand contained the least amount of concrete frost.

Average depth and occurrence of concrete frost under four cover conditions in northern Minnesota, winter of 1956-57[1]

Cover type	Average frost depth in inches	Sampling points with frost as a per cent of total sampling points
White pine-hardwood	1.9	57
Aspen	3.5	63
Balsam fir	5.9	73
Open area	8+[2]	91

[1]Based on measurements in the type up to and including April 17. After this no frost was found.
[2]Frost depths greater than 8 inches were recorded as 8+ because of difficulty in determining exact depths.



AVERAGE DEPTH OF CONCRETE FROST UNDER OPEN AND FORESTED COVER TYPES, WINTER OF 1956-57

The duration of freezing was abruptly ended by warm weather accompanied by warm spring rains (see Figure). Normally, concrete frost remains longer in open areas than under forest stands. Such a trend was evident in this study: Just before spring breakup, concrete frost was found on 50 per cent of the sampled points in the open area, 20 per cent in the balsam fir area, and none in the other two forested areas.

These limited observations indicate that forest cover is beneficial in reducing the formation of concrete frost and that a mixed, white pine-hardwood stand and an aspen stand are more effective in reducing frost formation than is a dense balsam fir stand.

The reasons for frost formation and disappearance are being investigated further.

FIELD NOTE BRIEFS

SOIL AND WATER RESEARCH

Secretary of Agriculture Ezra Taft Benson announced July 29 the appointment of a working group to study facility needs for soil and water conservation research. The study is being made at the request of the Senate Committee on Agricultural Appropriations.

Members of the working group are: Dr. G. M. Browning of Iowa State College, representing the State Agricultural Experiment Stations; Gerald E. Ryerson of the Soil Conservation Service; and Dr. Cecil H. Wadleigh and Dr. Darnell M. Whitt of the Agricultural Research Service. (Browning, Ryerson, Wadleigh and Whitt are members of the *Soil Conservation Society of America.*)

The working group will focus its attention on problems of national and regional importance, leaving for the attention of the states problems having only state or local significance.

The group will receive recommendations from federal, state, and local organizations concerned with the conservation of soil and water resources. Interested parties are invited to present their evaluation of the kind and extent of soil and water problems needing research. A series of public hearings is planned.

Those interested in making presentations to the working group at these hearings should make their requests in writing [immediately] to the secretary of the group, Dr. Darnell M. Whitt, Plant Industry Station, Beltsville, Maryland. Scheduled dates and locations of the hearings will be announced later.

The Senate and House Committees on Agricultural Appropriations received a number of proposals for soil and water conservation research facilities during the hearings on appropriations for fiscal year 1959. The Committees stated that the recommendations received had merit, but that the total needs of the country for soil and water conservation research facilities should have careful study.

Such a study will provide an estimate of total [*sic*] soil and water conservation research needs with respect to problems of regional and national significance, of the capacity of existing research facilities to meet those needs, and the need for any additional research facilities.

Representatives of federal, state, and local action agencies concerned with soil and water resources and state Agricultural Experiment Stations are expected to present material for consideration. The group will complete its study and make its report to the Secretary on or before December 31, 1958.

USDA COMMITTEE REPORTS

A program of broad studies on the complex soil and water conservation problems facing the Nation was urged by the U. S. Department of Agriculture's Soils, Water, and Fertilizer Research Advisory Committee at its 1958 annual meting.

The committee named research in *watershed runoff, irrigation efficiency, cropland moisture conservation,* and *water movement in soils* as among the most pressing needs in the area of work reviewed.

- In commenting on watershed runoff research, the committee noted that need has developed in recent years for accurate hydrologic records on areas containing less than 100 square miles. The committee said that new information is needed on the relations of water yield and flood flows to precipitation, physical characteristics, and land use and treatment in these small watersheds.
- Irrigation-efficiency studies were urged by the committee to develop methods of reducing water losses and applying and distributing irrigation water on western farmlands. Present practices in the West commonly result in the loss of a major part of water diverted from streams for irrigation. In many parts of the West there must be more efficient use of existing supplies of water.
- Cropland moisture conservation studies were recommended in humid areas, lying generally east of the Mississippi River. Determinations are needed on the amount of water lost by evaporation, the runoff after tillage operations from different types of soils, and the water economy of winter cover crops.
- The very survival of irrigated areas depends on the movement of water in soil to supply plant needs, the committee observed, and an aim of such work would be to prevent accumulation of harmful salts. The entry and movement of water in soil may be strongly influenced by kinds and amounts of salts in the water.

Other research proposals which the committee felt merit priority attention include:

- An increased effort to analyze and publish hydrologic data compiled by scientists in recent years.
- Expanded studies of the effects of forest and rangeland management practices on streamflow, erosion, and sedimentation.
- More research on the effects of logging practices on streamflow, erosion, and sedimentation.
- Expanded studies on conservation practices for western rangelands.
- More research on soil-water-plant relationships in humid areas.
- Strengthened studies to find out the relationship of soil organic materials to soil structure.

HIGHWAY FILLS AS DAMS

A highly significant news release has reached us from the Washington office of Senator John D. Hoblitzell, Jr., of West Virginia. According to the release, a proposal to impound water along the West Virginia sections of the Interstate Highway System has met with a favorable reception.

The plan calls for use of highway fills for the secondary purpose of impounding water and could result in "scores" of ponds and artificial lakes.

FELLOWSHIPS AVAILABLE

Announcements of the National Wildlife Federation's 1959-60 scholarship and fellowship programs are now being distributed. James Hopkins scholarships for undergraduate students will include grants up to $500 each. Graduate and post-graduate or special student fellowships will include grants up to $1,000 each.

Activities to be considered for grants are: teacher training, radio and television, scouting and conservation, curricular problems, farmer-sportsmen relationships, conservation workshop techniques, textbook development, journalism and state programs.

The scholarships and fellowships are financed largely by funds received from the distribution of the famous wildlife stamps, a National Wildlife Federation project initiated in 1938.

Completed scholarship and fellowship application forms must be postmarked on or before November 1, 1958, and mailed to: National Wildlife Federation, 232 Carroll St., N.W., Washington 12, D. C.

AUSTRIAN SAFEGUARDS

An expert commission has proposed a long-range plan for the replanting of 135,000 hectares (about 324,000 acres) of mountain forest as a safeguard against avalanches. Inquiries in the province of Tyrol have shown that in the inhabited areas alone there are about 2,000 recorded avalanche paths. *In recent years, two thirds of these have fallen across deforested slopes.*

A report to FAO says that current afforestation of catchment areas and mountain pastures above the timber line has shown that knowledge with respect to growth conditions of forest plants in high mountainous districts is most inadequate.

A research institute has been established in the Tyrol, which includes a department of climatic biology and a department of mycology, the former on the Patscherkofel mountain near Innsbruck (altitude 2,248 meters), and the latter located at Imst, Tyrol, with a field station at Obergurgl.

The practical research work done at the institute aims at facilitating reforestation work, making it feasible in a more economical way and ensuring greater success.

By artificial methods in specially air-conditioned environment and with the help of the most recent equipment, it is planned to bring about a drastic reduction in the time of experiments, to study the various influences on forest plants in high mountainous regions, and to derive special methods of planting and soil treatment.

Methods have been developed of inoculating nursery beds for conifers with mycorrhiza and these methods have proved suitable for reforestation at high altitudes. The degree of resistance of the young plants during their first years of growth is being greatly increased. The results obtained have been indeed amazing, as shown by a comparison made between the nursery beds that have been, or have not been inoculated.

Diethyltolumide will make you personally obnoxious to mosquitoes, chiggers and ticks, says the Southern Forest Experiment Station, New Orleans. Used on the skin at full strength, it enables the wearer to withstand mosquitoes for three to eight hours. When diluted with a dry-cleaning fluid and sprinkled or sprayed on clothing, ticks and chiggers refuse to attack for several days.

Book Reviews

THE BRITISH COLUMBIA ATLAS OF RESOURCES. *Edited by* J. D. CHAPMAN, D. B. TURNER, A. L. FARLEY, AND R. I. RUGGLES. *The British Columbia Natural Resources Conference, Victoria, B. C., Canada. 100 pages, 86 maps. 1956. $7.50 (paper for schools only), $10.00 (plastic cover). (Reviewed by* WALLACE E. AKIN, *Des Moines, Iowa.)*

The British Columbia Natural Resources Conference is to be congratulated for the publication of this Atlas, a notable achievement in presenting information about the resources of the province in a form that is both attractive and usable to the student, conservationist, and interested layman. The 100-page Atlas has 48 map pages (17" by 22") and a total of 86 maps, all in full color. Each map page is faced by a text page pertaining to the material presented on the map. These pages are illustrated with excellent black and white photographs depicting the resources of the area. The success of this publication is indicated by the fact that the DeLuxe edition is already out of print.

The Atlas is organized into three major sections: (1) *Geographical Characteristics*, (2) *Resources Use*, (3) *Map Indices*. The Geographical section sets the stage for the presentation of further material by summarizing the physical and human aspects of the resource base. This section includes maps of relief, oceanography, landforms, geology, soils, meteorology and climate, and biotic regions. Included under Human Elements are maps showing native Indians, economic activities, exploration and survey, sequence of settlement, and several aspects of population. The Resource Use section is subdivided into resources of agriculture, fisheries, forestry, mining, power and energy, recreation, water, wildlife, manufacturing, and transportation, with each of these subdivisions containing several maps. A valuable addition is the Map Indices which give very complete data on reference and manuscript maps, published maps, air-photo coverage, and a gazetteer. Most of the maps in the Atlas are on a standardized base of one inch to 55 miles, with special inset bases to a scale one inch to 38 miles and one inch to 14 miles for the more highly developed southwestern area of the province. However, scales have been carefully selected for clear presentation of the data.

The criteria for map selection is summarized by the following statement from a report on the preparation of the Atlas made by J. D. Chapman, one of the editors: "The selection of the specific maps in each part is the result of a compromise between what information illustrates most effectively the outstanding features of the various topics and what amount and type of data it was possible to analyse in the time available. Almost all the maps present data which had hitherto not been generally accessible either because it existed in manuscript form or because it was contained in a variety of publications with limited distribution. In every case the maps and texts were prepared by experts in the specific fields and in some instances required considerable original research on the part of those concerned. The text pages were written, wherever possible, by those responsible for the compilation of the maps and were designed to provide explanation, amplification and supplementation of the cartographic material."

An undertaking of a publication of this magnitude and detail required the coordinated efforts of a great number of experts in many fields of resources and resource management. Mr. Chapman indicated that 80 to 100 experts in the province gave their time and skill voluntarily for a total of more than 20,000 man-hours of work. Approximately two and a half years were required to produce the Atlas in its final form.

This Atlas like the *Atlas of the Pacific Northwest* (reviewed in the November, 1957 issue of the JOURNAL) adds greatly to our basic knowledge of areas of limited extent such as states, provinces, or regions. A perusal of this type of publication, which is all too rare today, makes one realize the desirability of more efforts along similar lines. Such projects should be encouraged or even undertaken by conservation organizations in our various states. *The British Columbia Atlas of Resources* could well serve as a guide to such endeavors.

RIVER BASIN DEVELOPMENT. *Law and Contemporary Problems. Duke University, Durham, N. C., (Vol. 22, No. 2; Spring 1957), 322 pages. $2. (Reviewed by* LAWRENCE G. HINES, *Hanover, New Hampshire.)*

Although the United States does not face an imminent water shortage, it is confronted with the necessity of using water more economically, developing the optimum potential of our water supply, and allocating and husbanding water carefully in virtually all areas of the country. Water serves many purposes: support of living resources, agriculture and irrigation, power generation, navigation, waste dillution and disposal, recreation, and human consumption. Some of these uses conflict with others, but all have value—a worth that increases as our economy

and population expand and press upon an essentially fixed water supply.

The obvious answer to the accelerated demand for water that has accompanied our increasing population and expanding economy is reuse of water. But for water in reuse to perform satisfactorily the many functions that it has served in the past, increasing outlays for pollution abatement, silt control, and water treatment must be made. It is unfortunate evidence of intellectual lag that a symposium on river basin development, which otherwise includes some outstanding papers, largely ignores both the overall appraisal of water supply and demand and the sometimes critical problem of water pollution control.

The papers in this symposium are written under the following titles: "A Perspective of River Basin Development," "Some Engineering Aspects of River Basin Development," "The Economic Dynamics of River Basin Development," "The Social Consequences of River Basin Development," "The Evaluation of River Basin Development," "The Politics of River Basin Development," "Basic Water Rights Doctrines and Their Implications for River Basin Development," and "A Model State Water Code for River Basin Development."

Two of these papers, "The Economic Dynamics of River Basin Development" by William E. Folz and "The Evaluation of River Basin Development" by Hubert Marshall, are penetrating analyses of the procedures of evaluation and the nature of the accomplishments of Federal river basin projects. In addition, Frank Treaslease's "A Model State Water Code for River Development" should be of interest and assistance to state legislators and public officials concerned with water resource administration.

Folz's paper on economic dynamics is a skillful blend of the economic theory and factual information required for evaluation of public investment in water resource development. Folz demonstrates a wide acquaintance with natural resource projects and mature judgment in his policy recommendations. The findings, expressed as specific "tentative conclusions," are generalized in such a way that other research workers can validate and build upon them. *This paper is an excellent illustration of the type of research that facilitates the accumulation of knowledge since it provides a clear basis for further refinement of analysis.*

Marshall's paper on economic evaluation is concerned largely with the historical evolution and present use of "benefit-cost" analysis, the increasingly-criticized technique generally employed by such agencies as the Army Corps of Engineers, the Bureau of Reclamation, and the Department of Agriculture in petitioning Congress for appropriations for water development projects. The controversy and problems that arise as a result of the use of benefit-cost analysis are many and far from solution. But Marshall gives a clear and non-doctrinaire explanation of the development and consequences of the use of this special technique.

Although the quality of the papers in this volume is uneven, there are few superficial and partisan articles. The serious student of water resource problems will find much of interest in this symposium.

ELEMENTS OF ECOLOGY. *By* GEORGE L. CLARKE. *John Wiley & Sons, Inc., 440 Fourth Ave., New York 16. 534 pp., index, illus., references, 20 pp. 1954. $7.50. (Reviewed by* WILSON F. CLARK, *Billings, Montana.)*

An economist colleague and I frequently argue as to whether economics is merely a branch of conservation, or conservation is but a phase of economics. For me the argument has been resolved to our mutual defeat by G. L. Clarke in his *Elements of Ecology*. This stimulating, thought-provoking writer points out in the early stages of his book that all of man's endeavors are carried forth within the framework of his particular environment; and that for man, as for every other living thing, to be and remain successful he must hold to his place and function in the environment. True, man has the ability and technology to create artificial environments, such as skyscraper cities, but do these not merely cause the extension of man's supply lines leading back to the basic resources rather than exist as independent systems? The economics of our industrial system, the many problems of conservation are but portions of the vast dynamic system of which we are a part. To quote Clarke:

> "Ecology is really an extension of economics to the whole world of life." (Conservation, forestry, agriculture, fisheries, and wildlife management are a few of the branches of applied ecology.) "The need for a knowledge of the proper adjustment among men and between man and his natural environment was never greater than it is today. Like other animals man is influenced by the physical features of his environment, he is absolutely dependent upon other species, and he must adjust to other individuals of his own species. At the moment, man is suffering from lack of these adjustments."

With this basis, the author then presents a broad view of plant and animal ecology. Using many specific and fascinating examples taken from his own and many other workers' research, he discusses the medium *in which* organisms live, the substratum *on which* they live, and the several major factors of water, light, oxygen, carbon dioxide, and mineral nutrients. He then considers intra- and inter-species' relations, the development of communities, successions, fluctuations, and the dynamics of vari-

ous ecological complexes. It is in this last section that man as a member of such complexes is considered.

Clarke has by no means written a book on how man can win friends and influence environments. On the contrary, throughout the book the emphasis is on fundamental principles of ecology, with many specific examples drawn from studies in oceanography, biogeography, agriculture, forestry, limnology, soil science, biochemistry, zoology, range management, fish and wildlife management, and a host of other fields. One will not find here the answers to the myriad practical problems encountered in the various fields of *applied ecology* (management), but *what one can gain is a vast strengthening of a conviction that a sound ecological approach to those problems will allow us to hit closer to the answers.*

Elements of Ecology is written as a textbook. It is well organized, documented and illustrated, and has a carefully compiled index. Unfortunately it lacks a glossary, which would have been of great value to the non-ecologist meeting the terminology for the first time or, for any person after a lapse of several years from his study of the subject.

I felt that the portion dealing with soil formation overlooked several major aspects of transported soils, with undue emphasis placed on residual soil formation. In the section dealing with water chemistry (particularly oxidation-reduction potentials and the several equilibria existing in a carbon dioxide-water-calcium ion system), certain explanations and uses of terms were evidently drawn from specific usages peculiar to ecology, and would not be clear to, let us say, a non-ecologist chemist. With these few minor exceptions, the book was uniform and lucid.

Clarke's *Elements of Ecology* could be of significant value to members of the *Soil Conservation Society* for, as the author states, "Because of a lack of understanding of ecological principles the efforts of well-intentioned conservationists and agriculturalists are frequently badly misdirected." For the same reason may I recommend the book also to engineers, technicians and policymaking officials in many agencies that deal with the land and water.

CONSERVATION EDUCATION IN AMERICAN COLLEGES. *By* CHARLES E. LIVELY AND JACK J. PREISS. *The Ronald Press Company, 15 East 26th Street, New York 10. 267 pp., not indexed, appendix (forms used in surveys), 76 tables, 8 figures. 1957. $5. (Reviewed by* D. E. WADE, *Des Moines, Iowa.)*

This is an up-to-date survey of the status of conservation education in United States colleges and universities. Conservation is treated as a social process and the authors carefully define the tasks it must perform. There is a review of much of the historical development of conservation education; and the survey's objectives, methods, and major findings are reported in full.

The authors immediately point out that, although various technologies are involved in the practice of conservation, these are "but the tools by means of which the complex social process [of conservation] is carried out. . . . Ideas as well as people and things must be regarded as resources."

The authors offer a definition of conservation: "In a dynamic society, conservation consists of balancing the use of natural resources and the varying demands of population in such a manner that existing resource supplies will not become exhausted before adequate substitute supplies have been discovered or invented and made available for use."

This seems to be a very worthwhile definition that will become generally accepted. On the basis of this definition, one can identify many resources that have been a source of misunderstanding among those who would develop or exploit (convert to dollars) and those who would set aside for other values certain resources which cannot be measured too readily by dollars: Examples are wilderness, natural areas, space, wildflowers, scenic beauty, unspoiled stretches of streams, and many kinds of wildlife not given an "economic" rating. One might also include those plants and wild creatures and "successional stages" that are considered "subversive" to human "use" because of our past unqualified prejudices (hawks, owls and many other "predators" fall into this grouping). Human beings cannot replace wilderness, natural areas, and many wild plants and animals, once these are eliminated from the landscape. "Substitutes" would obviously be of a degraded quality. One must also consider high-value agricultural lands in the category of irreplaceable resources.

In view of the irreplacable high-quality agricultural lands, it seems essential that national, regional and local policies be invoked. Flooding by reservoirs, urban sprawl, and super-highways are, by their very nature and methods of establishment, riding roughshod over the land and democratic procedures. Further and more serious degradation of land and water must be faced in "atomic fallout". Our present serious pollution of waters by domestic and industrial wastes, and silt, is among the great conservation problems of today.

Conservation Education in American Colleges is an important document. It will help raise standards of conservation education, not only in the United States but elsewhere in the world. It has opened the door to many other inquiries. The Conservation Foundation is to be congratulated for having sponsored this study. A survey of such importance needs an index; this is our only quarrel with the book.

FOREST SOILS. *By* S. A. WILDE. *The Ronald Press Company, 15 East 26th Street, New York 10, N. Y. 537 pages, illus., indexed. 1958. $8.50. (Reviewed by* BERNARD FRANK, *Washington, D. C.)*

This textbook is a revised version of the author's "Forest Soils and Forest Growth," published in 1946. It retains essentially the same approach and concentrates on essentially the same geographic areas and subject matter but has been greatly improved to stress more recent problems such as the use of chemicals, inadequate growth on depleted soils, and erratic results of partial cuttings. To that end Wilde considers those aspects of the field which will help appraise these problems more effectively, including a recognition of special situations and the correlation of management practices with the potential productivity of forest lands.

The book is divided into two main parts: *Part I*, with 10 chapters, takes up the genesis, properties, and functions of soil and its relations with plant growth. Such knowledge is essential to the adequate care and management of forest nursery soils, evaluation and development of forest planting sites and management of established forest stands. *Part II* (8 chapters) deals with the practices necessary to maintain, improve, and adapt forest soils to particular needs. It shows how soil characteristics and conditions relate to the vitality of tree growth, including the susceptibility of stands to insect and disease attacks.

The author summarizes the growth of interest in forest soils and their management by foresters. Today it is being increasingly realized that, "cuttings based only on the above-ground features of forest stands may ruin the natural fertility of soil, initiate soil erosion, or alter adversely the level of ground water. Such cuttings seldom assure the success of natural reproduction." (Page 16.)

Chapter 16 on unproductive forest soils and methods of improving them holds special interest for conservation-minded forest managers. Its contents include the utilization of runoff water (via furrows, ditches, other waterspreading devices), partial drainage of wet lands, as through lowering of high water tables, and regeneration of raw humus soils.

The section on fertilization deserves careful study. It presents many practical do's and don'ts and suggests field tests to avoid getting too deeply committed and especially to avoid confusing results from inadequately designed experiments. For example, it suggests the desirability of determining in advance whether fertilizers are needed at all. In some cases soil deficiencies may arise from poor drainage, aeration, etc., rather than from lack of nutrients. "All these prerequisites narrow down considerably the general possibilities of the use of fertilizers in silviculture and limit the chances of successful fertilizer treatments to particular cases where such treatments are made with a thorough knowledge of soil conditions." (Page 453.)

Wilde's brief outline of the contents of forest soil surveys is timely and pertinent in view of the serious activities in this field by both public and private forest enterprise. His succinct evaluation of the similarities and differences between surveys of agricultural and forest soils is quite germane as it will help foresters and others new to this field develop a better grasp of what is involved.

Wilde emphasizes that the importance of soil characteristics is commonly more obvious in reforestation than in timber harvesting, since indiscriminate planting is usually paralleled by failure or stagnation of plantations. This does not mean, however, that soil conditions and responses can safely be ignored otherwise. Indeed, the book contains much practical material on the ecological aspects of forest soils and forest management, thus providing a good background for the author's numerous observations and prescriptions for meeting given conditions in given areas. Quite refreshing along this line is his observation that, "Thinnings conducted on the basis of abstract formulas and without regard to environmental conditions may not only decrease the rate of stand growth but may lead to complete destruction of the stand." (Page 466.)

Some phases of the field are treated less adequately than some might like, particularly those technicians with special problems on which they would like as much documented information as is available. Also, some of the author's terminology may not appeal too much to those accustomed to a more standardized or more established terminology, as, for example, in the classification of humus types. And again, some may object that the author's references are confined mainly to the northern Lake States region with which he is most familiar by reason of his long experience there. However, the principles which he develops and amplifies apply to many other areas, and, as the citations show, he has diligently brought together a very wide range of literature from foreign as well as American sources.

Forest Soils should not be too technical for trained forest managers. Frequent reference to it will help modify tendencies to make decisions based on standard silvicultural considerations alone. And in these times when the hydrologic aspects of forestry are receiving more emphasis as part of the broader field of watershed management, Wilde's book will help inculcate a better appreciation of the role of the soil in the functioning of the water cycle.

LITERATURE BRIEFS

Learning About Soil & Water Conservation. By Adrian C. Fox and George E. Rotter. 63 pp., illus. Johnsen Publishing Co., 1135 R. St., Lincoln, Nebraska. 80c. Discount of 25% for quantities over five.

This is a text-workbook for use in social studies or language arts (grades 5-8). Adrian Fox is educational specialist with the SCS and George Rotter is curriculum coordinator and director of conservation education with the Nebraska State Department of Education.

Even highly-trained and experienced soil and water technicians would derive much value by working through this publication and performing the exercises in "think and write". Any one would profit by the "think and write" part which deals with 12 full-page reproductions of photographs that cut across land and water management.

A four-page "teacher's manual" will be furnished on request, but only for instructional purposes. Suggestions for use and enrichment activities are listed.

Learning About Soil and Water Conservation, along with the two *SCSA* publications, **The Wonder of Water** and **The Story of Land**, would make an excellent set of books for grades 5-8 in any school.

Wise Use of Wyoming Resources. By Harold V. Webb. 1957. 129 pp., illus., indexed, glossary. Wyoming State Soil Conservation Committee, 308 Capitol Bldg., Cheyenne, Wyoming. (No price given.)

Directed largely at young people and schools, but will serve adults.

Conservation Directory. A listing of International, National, Regional and State Organizations and Officials Concerned with the Protection of Wildlife and Other Natural Resources. 109 pages. 1958. National Wildlife Federation, 232 Carroll St., N.W., Washington 12, D. C. 50c per copy; 25 or more copies, 40c each.

This is one of the most useful directories for conservationists and educators. In the 1959 *Directory*, an effort should be made to get all the chapters of the *SCSA* included, under the respective states. Get your copy early as the number printed is limited.

Farmers' Expenditures in 1955 By Regions. 1958. 134 pp., 73 tables, endpiece map showing primary sampling units and regions. Prepared by U. S. Dept. of Agriculture and U. S. Dept. of Commerce. For sale by Supt. of Documents, U. S. Govt. Printing Office, Washington 25, D. C. $1.

Agricultural Conservation Program, Summary 1956. 106 pp., 17 tables. 1958. USDA, Agricultural Conservation Program Service, Program Analysis Division, Washington, D. C. No price listed.

Fulfilling American Democracy: The Conservation Movement, 1907 to 1921. By J. Leonard Bates. The Mississippi Valley Historical Review, Vol. XLIV, No. 1, June 1957, pp. 29-57. Mississippi Valley Historical Association, 1500 R Street, Lincoln, Nebraska. Price for issue, $1.25.

J. Leonard Bates is assistant professor of history in the University of Illinois. He has prepared a scholarly discussion that is helpful in obtaining an understanding of the development and growth of the conservation movement, and the agencies, organizations and individuals involved. Leonard's conclusion: "The faith [conservation policy] was genuine; the propaganda effective. Though a careful evaluation of the impact upon this country remains to be made, it is difficult to escape the conclusion that a fighting band of conservationists has made the United States much richer in material wealth and in the democratic spirit and faith of its people."

The Great Plains Shelterbelt in 1954. By Ralph A. Reed. 1958. 125 pp., illus. 57 tables, appendix. The Experiment Sta. of the University of Nebraska College of Agriculture., Lincoln. (No price given.)

Toward a Realistic Farm Program. By J. Cameron Thomson. 1958. 54 pp., appendix. Committee for Economic Development, 711 5th Avenue, New York 22. (No price given.)

Pasture Irrigation Handbook. 1957. Five articles issued by the Department of Agriculture, South Australia. 63 pp., illus. (Copy can be obtained through Dept. of Agriculture, Box 901 E., G.P.O., Adelaide, Australia. No price given.)

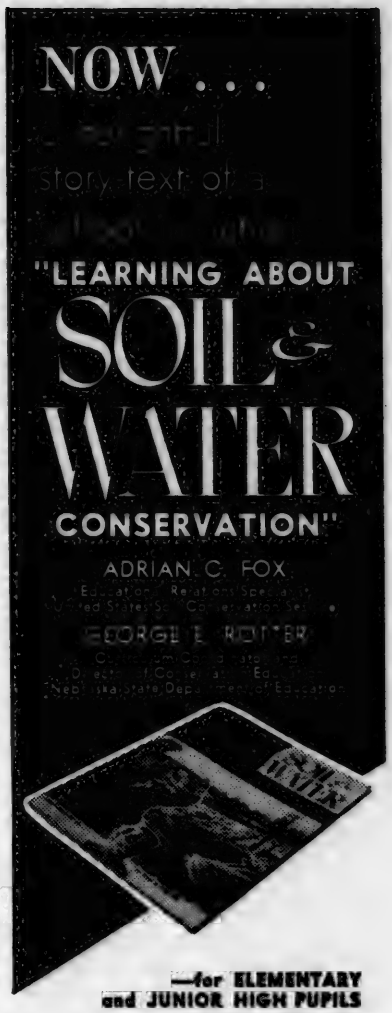
Effects of Plowing & Seeding on Some Forage Production & Hydrologic Characteristics of a Subalpine Range in Central Utah. By Howard K. Orr. 1957. 23 pp., 11 tables. USDA, Forest Service, Ogden, Utah. (No price given.)

Teaching Soil and Water Conservation. By Albert B. Foster and Adrian C. Fox. 1957. 30 pp., illus. USDA, Soil Conservation Service, Washington, D. C. (No price given.)

More Wildlife Through Soil and Water Conservation. By Wallace L. Anderson and Lawrence V. Compton. 1958. 14 pp., illus. For sale by Supt. of Documents, U. S. Govt. Printing Office, Washington 25, D. C. 10c.

CORRECTION

Lines 27 through 29, column 2 on page 180 of the July, 1958 JOURNAL should read: "This is a matter of concern because it is quite possible that an increasing number of our future political leaders will *not* be drawn from those who have had direct contact with resource problems." The omission of the "not" was an editorial office error and not that of the author's.—EDITOR.



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Man and Modern Society. By Rollo E. Wicks. 462 pp., index, questions for discussion and reading lists for each chapter, illus. 1958. McGraw-Hill Book Company, 330 West 42nd St., New York 36, N. Y. $6.

Although prepared as a textbook for use in two-year colleges, this is an introduction to a better understanding of modern technological society. The "ecological approach" is used throughout. The chapter on "Conservation of Natural Resources", although necessarily limited in scope and coverage, should enable a two-year college student to grasp some of the fundamental concepts. For those who have been out of college for five or more years this book is a refresher for a better look at modern society.

Basic Ecology. By Ralph and Mildred Buchsbaum. 192 pp., index, illus., bibliography. 1957. The Boxwood Press, P. O. Box 7171, Pittsburgh 13, Pennsylvania. Paper bound edition $2.35.

This book is intended as an "interim" book to fill a gap in the "biology" background of first-year college students. It should also find much use in high school biology (ought to be ecology). For conservation workers, not previously exposed to a course in ecology, this book is a good starter. We regret that some ecologists fail to list the JOURNAL OF SOIL AND WATER CONSERVATION in bibliographies.

Modelmaking for Industrial Design. By Ralph R. Knoblaugh. 1958. 276 pp., 287 illus., index, supplementary reading list. McGraw-Hill Book Company, 330 West 42nd St., New York 36, N. Y. $9.75.

Although this book is written for those working primarily in the industrial arts, there is much to commend this book to those who must prepare three-dimension, conservation models and exhibits related to farm layout, structures, soils, water, hydraulics, forestry, land-use, and land-planning. This is a high-grade "how-to-do-it" book, and the basic techniques are given for working with plaster of paris, plastics, metal and wood, using simple hand tools and small power tools. Layout, assembly and paint finishing are adequately covered.

Conservation Education in American Schools / Twenty-ninth Yearbook of the American Association of School Administrators. 527 pp., index of persons and subjects. Appendices: Selected references; audio visual materials; organizations and agencies concerned with conservation. (Pages 333-520 is a listing of members of AASA, which is a department of the National Education Association.) AASA, 1201 16th St., N.W., Washington 6, D. C. 1951. Originally listed to sell at $4; is now $3 per copy, or $1.50 in quantities of ten or more.

For the price, especially on lots of ten or more, this is a bargain in conservation literature. This yearbook has already helped in getting much conservation education accepted in schools throughout the United States. For $15, local conservation organizations or soil conservation districts can now get this Yearbook into the hands of at least ten schools, libraries, or teachers. Don't miss on this one.

Tidal Marshes of the Gulf and Atlantic Coasts of Northern Florida and Charleston, South Carolina. By Herman Kurz and Kenneth Wagner. 1957. 168 pp., illus., 15 tables, not indexed. Florida State University, Tallahassee. $1.

This is an excellent publication and will be most helpful when land, water and living resources problems involving portions of the Eastern and Gulf coasts are considered more intensively. The studies were aided by a contract with the Office of Naval Research, Dept. of the Navy.

World Population in Relation to Potential Food Supply. By Warren H. Leonard. The Scientific Monthly, Vol. 85, No. 3, September 1957, pp. 113-125.

Although Leonard does not cite William Vogt, *Road to Survival*, a comparison between the two publications shows many comparable conclusions. Vogt's book had been viciously attacked, but subsequent writings in "scholarly" and "scientific" journals and couched in more sedate language seem to agree with Vogt's points. Leonard is an agronomist.

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News Notes

President's Column

Conservation Report

A salute is due the National Wildlife Federation for its *Conservation Report*. This report, financed by stamp sales, outlines pending legislation and its status toward enactment on all conservation matters before Congress. Only certain Federal agencies maintain comparable information.

The *Conservation Report* provides professional conservationists, leaders of citizens conservation groups, educators, conservation administrators and conservation reporters with valuable data. Knowing about pending legislation should enable those interested in natural resources to express their opinion before legislation is enacted. The *Report* is an outstanding example of service.

On to Asheville

The *Society's* Annual Meeting at Asheville (October 19 to 22) is near at hand. Ralph Sasser, Charles Patton and members of their committees have been working hard for many months to make this an outstanding meeting. They have succeeded in arranging a program attractive to every member. Asheville in October is one of America's beauty spots. I predict the Asheville annual meeting will have the largest attendance of any to date. Will you be there?

Part of the responsibility of every conservationist is to keep informed about his profession or his specific resource interest. This is done in many ways—one of which is attending annual meetings of conservation organizations. Beyond the information obtained is the opportunity to see leaders in your field and to become acquainted with co-workers from other parts of the country. Such an experience is a morale booster which is beneficial to each of us.

See you in Asheville. Let's have every Chapter represented.

Dollars for the Journal

Financing the JOURNAL continues to be one of the *Society's* most perplexing problems. It is estimated that about 25 pages of paid advertising ($4,000) would be required in each issue to meet all costs. When you observe the extent of advertising in an issue of the JOURNAL, the cost that must come from the general fund can be determined. I do not believe that it's necessary to make the JOURNAL entirely self supporting. However, present JOURNAL financing from the general fund will cost at least $15,000 for the year. This represents the entire annual dues of 3,000 members. The more we can reduce this drain on the general fund by additional advertising in the JOURNAL the greater will be the opportunity to provide other services.

We also need to let the advertisers know we are aware of their advertisements. If an advertiser offers a publication, for example, more of us can write for it. Perhaps you know of a potential advertiser; you can help by dropping a line to the *SCSA* office in Des Moines.

Earl Johnson, a member of the Southern New England Chapter, is doing outstanding work in obtaining advertising. He is responsible for several new accounts appearing in recent issues. We need someone like Earl in each of our 100 chapters. Let's talk about it at Asheville.—RUSSELL G. HILL, *President*.

R. Y. "DICK" BAILEY RETIRES

Richmond Young Bailey was born on a hill farm in Chambers County, Alabama, on November 15, 1893. He grew to manhood in daily contact with the practical problems of farm life.

As "Dick" Bailey retires from an active career of service to agriculture, one of his homely observations probably will serve better than anything else to illustrate his attitude toward the job he did so long and so well.

"If we can help a farmer develop a better pasture that will raise the level of the milk in his pail by just one ring," Bailey once said in the early days of the soil and water conservation program, "we will have benefited him and his family."

In April 1934 he was chosen by Dr. H. H. Bennett, then Chief of the Soil Erosion Service, to serve as regional director for Alabama and Florida. He quickly saw the possibilities of using all the land on a farm for productive purposes. He called it "putting idle acres to work."

In September 1936 Bailey was designated to serve as regional agronomist of the Soil Conservation Service for the Southeast, with headquarters at Spartanburg, South Carolina. He continued in this position until October 1951 when he became research liaison representative with headquarters at Spartanburg and later at Auburn, Alabama.

His wise counsel has not been limited to technical fields. He is best known to many because of his ability to recognize and help solve the problems of others.

Charter member (Card No. 24) and president of *Soil Conservation Society of America*, 1954; election as Fellow of *SCSA* in 1946—these are but a few of his many honors.

As R. Y. "Dick" Bailey retires from the field of active professional conservation and agriculture, the esteem and good wishes of his countless friends and associates of more than 40 years go with him, and all wish for him and Mrs. Bailey many more years of useful life and happiness together.—*Prepared by a "long-time associate and close friend."*

TAX DEDUCTIONS AVAILABLE

At the suggestion of the Virginia Chapter the following material was checked with the District Director of Internal Revenue. We advise further checking with your local authorities but because several members participating in chapter meetings may not be taking advantage of certain Internal Revenue Service rulings, we wanted to publish the information.

The Internal Revenue Service under Ruling 55-4, I.R.B. 1955-1, states that a tax payer "who gives his services gratuitously to an association, contributions to which are deductible, who incurs un-reimbursed traveling expenses, including cost of meals and lodging, while away from home in connection with the affairs of the association, and at its direction, may deduct the amount of such un-reimbursed expenses in computing his net income." This is subject, however, to the limitation in respect to all gifts made to exempt organizations of our type, namely, that the total amount of such gifts made in any one year may not exceed 20 per cent of the donor's gross income for such year. This limitation means that while such expenses are deductible they are included with other gifts in computing the 20 per cent limitation.

On checking the ruling with the District Director of Internal Revenue Service he responded by letter stating: "Revenue Rule 55-4 which you quoted, does apply to your organization and you would be correct in forwarding such information to your officers and members."

Remember, too, that your annual dues are deductible.

Canadian and other foreign members will need to check their respective regulations. The above applies only to the United States.—H. WAYNE PRITCHARD, *Executive Secretary*.

To the Editor:

We have read with interest your **Field Note Brief,** entitled "Recovering Rainfall," in the March JOURNAL OF SOIL AND WATER CONSERVATION.

"Recovering Rainfall," or the Barr study, was published in October, 1956, so it was with some wonder that we noted the item was inspired by a news release of the Wildlife Management Institute, apparently recently issued.

The Arizona Watershed Program was, without doubt, brought into focus by the study made under the direction of Dr. Barr, but, as the writer pointed out at the annual meeting of the Arizona Water Resources Committee on January 22, 1958, when the study was completed, its work done, the group responsible for it was dissolved.

Using the Barr study as a guide, practical considerations relating to acceptance of its recommendations and how they could be implemented, were taken over by a newly created Division of Watershed Management in the State Land Department and a non-paid citizens' group, the Arizona Water Resources Committee.

Some of the recommendations had already been proven effective for greater water yield in studies made by scientists on small plot bases. Before putting them into general practice, it was now necessary to test them on bases, comparatively larger, but still not wholesale. This testing on experimental watersheds is being carried out by federal agencies—the Forest Service, Bureau of Indian Affairs, Geological Survey, Agricultural Research Service—with state and regional agencies, and individuals cooperating.

Three statements in the note we believe could be clarified.

The first—that the main purpose of the study was to provide more runoff for "irrigated farming in the Salt River Valley." Mr. R. J. McMullin, general manager of the Salt River Valley Water Users' Association, and Salt River Project, at a meeting of agencies contributing to the Arizona Watershed Program, September 23, 1957, refuted this when he said: "No longer is our stake in the watershed related only to agricultural values. . . . Industrial development . . . must be firmly backed by runoff. . . . I have been talking not only about the farmer's stake but also the stake that affects every man, woman and child in the Valley today and those yet to come."

The second statement, that "all other watershed values . . . would be subordinated . . . for more water for irrigation," we believe can best be answered by glancing at the list of members of the Arizona Water Resources Committee in the enclosed brochure. [Brochure received in the editorial office of the JOURNAL.] As you will see, the major economic interests of Arizona (city, farm, industry, timber, livestock, mining, finance, recreation and wildlife) are represented.

The third is the reference to questions raised by those living on the watershed about erosion, siltation and floods. The program is supported by both upstream and downstream users—in fact, users living on the watershed were among the first to call attention to the need for improving watershed conditions for downstream as well as upstream use. Recommended treatments of the watershed will, research has shown, greatly reduce erosion, and consequently siltation, particularly in the pinyon-juniper and chaparral—two types that, without treatment, discharge excessive amounts of silt into streams and dams. Flood hazard is and will continue to be of utmost concern to the Program. That it is not of immediate concern is because of the numerous dams on the Salt and Verde watershed where most of the research projects are located at this time.

I am sure you will be interested in reading the resolution adopted by the Arizona Soil Conservation District Association at its annual winter meeting, January 18, 1958: "We hereby reaffirm again this Association's support of the Arizona Watershed Program as currently outlined and proposed by the Arizona Water Resources Committee."

That production of water is a major concern of all groups was brought out by Chief Forester Richard E. McArdle in his talk at the annual meeting of the Committee. Dr. McArdle said: "Water yields will receive major consideration in the multiple use management of national forests in the Southwest."

The Arizona Watershed Program is not static. Changes and refinements will no doubt be made as research gives us more knowledge of the science of intensive watershed management. Very recently (February) a joint study was begun by the Forest Service and Arizona Game and Fish Department to evaluate effects of watershed management practices on game and wildlife. Both the Arizona Water Resources Committee and the Watershed Management Division have endorsed this study and offered their full cooperation.

We would be happy to see this letter published. [Letter dated May 9, 1958.]

KEL M. FOX, *Secretary*
Arizona Water Resources Committee
P. O. Box 2649, Phoenix, Arizona

To the Editor:

I was glad to see the 1957 annual report of Resources for the Future reviewed so extensively in your July issue. I wish that your reviewer, Dr. Hines, had found more to approve in the program itself and (especially because I edited the report) the manner of its presentation; but after all, those are matters of opinion. I can only hope that most readers of our report found it more informative than did Dr. Hines.

There is one point of fact in the review, however, that I should like to straighten out: the way in which RFF divides its support between staff studies and grants. By comparing the amount appropriated for new grants and research agreements during the 1957 year ($96,940) with expenses for both staff research and over-all administration ($534,999), Dr. Hines concludes that "unfortunately, support of independent research is small relative to staff projects." Use of these two figures only overlooks the $305,029 in payments during 1957 in support of grants and research agreements approved during the previous year. When the money actually paid out in support of the year's new grants is added in, the total comes to $378,974 for grants and research agreements in comparison with $389,937 for staff research. (All these figures are as easy to find in the report as those cited by Dr. Hines.) The expenditures of $145,062 for administration relate to the grant as well as the staff phase of the program. It is true that *new* grants and research agreements were on a relatively small scale during 1957. This is a special circumstance, specifically noted in the report by R. G. Gustavson, executive director. This change," he wrote, "does not connote any slackening of our interest in grant making or any decline in opportunities to support promising work; it is simply the result of our having committed nearly all of our funds for the current phase of our program." These commitments, of course, included going grant programs as well as staff work.

This temporary situation, incidentally, no longer holds; last spring The Ford Foundation made a grant of $5,375,000 to RFF in support of work until September 30, 1964, five years beyond the terminal date of the former grant. In making the new grant, The Ford Foundation expressed the hope that RFF would continue to divide its support about equally between staff and grant programs.

I have gone into all these figures only to show that in 1957, as in other years, grants had a major place in RFF's program. Whether such arrangements are intrinsically more effective than RFF staff studies and, if so, exactly what percentage of a year's budget they should represent are, of course, matters of opinion. The officers and directors of RFF have not expressed any hard and fast preference for one method over the other, in the belief that methods should vary with circumstances. I am sure, however, that they would not characterize staff research as any less "independent" than arrangements with other institutions or with individuals.

HENRY JARRETT
Editor, Resources for the Future
Washington, D. C.

To the Editor:

In his stimulating article in the May, 1958, issue of the JOURNAL ("Districts, Forestry, and Wildlife Management"), Charles A. Stoddard has made two recommendations on how the Soil Conservation Districts may promote better woodland management, and one on how they might increase the acreage available for wildlife habitat. I should like to comment on all three.

It is hard to understand why the United States Forest Service and State forestry agencies have not taken more eager advantage of their magnificent opportunity to improve their own operations by entering into cooperative agreements with the almost 3,000 Soil Conservation Districts that are spread over the Nation.

All 52 of the State and Territorial Soil Conservation District Laws authorize the soil conservation districts to include in their program operations "seeding and planting of waste, sloping, abandoned, or eroded lands to water-conserving and erosion-preventing plants, trees, and grasses; forestation and reforestation . . . [and] soil stabilization with trees, grasses, legumes, and other thick-growing, soil-holding crops." The Districts have signed coopera-

tive agreements with approximately 1,800,000 land-operators. Most of these farms include woodlots of various sizes.

Neither the Congress, nor the State legislatures, nor the U. S. Department of Agriculture, nor the Soil Conservation Service have ever intended that the Districts shall serve as local cooperating agencies for the Soil Conservation Service alone. Other federal and state agencies have, of course, worked with and through the Districts, to their great mutual benefit, in hundreds of instances. But still the wonder grows that so broad and inviting a road has been traveled so infrequently.

The local Districts can do far more to promote good woodland management than any other local agencies—if only the state foresters and the U. S. Forest Service will offer them the guidance they ask for and the technical and economic assistance they need. Even the "jurisdictional jealousies" usually cited as the explanation for the failure of the foresters to use fully the magnificent instrument that the State legislatures have fashioned for them, does not adequately explain this partial failure, because it is the foresters themselves who would gain jurisdictional growth and bureaucratic success if they would channel more of their activities through the local Districts. Mr. Stoddard's call to the foresters to grasp this opportunity is, therefore, very sound indeed.

When Mr. Stoddard suggests, however, that the Districts might also take on the task of managing small woodlands for their owners (including the harvesting and marketing of merchantable timber, record keeping, correlating market information, and supplying buyers with volumes and prices of timber products offered for sale—all this to be done by the Districts for a fee), he makes a more questionable suggestion. The Districts are neither authorized nor equipped to serve as either farm managers or forest managers. They can do everything that needs to be done to improve farm and forest management practices in the interest of soil and water conservation, but actual management and marketing is a task for the owner himself and is outside the competence of the Districts.

It seems to me that the lines of desirable action have been clearly charted in Minnesota. The Report of the Forestry Study Commission to the Minnesota Legislature, in 1954, recommended that the Minnesota Conservation Department, Division of Forestry, cooperate directly with the Soil Conservation Districts of Minnesota to promote the best possible woodland management practices. Early in 1958, the Minnesota Conservation Department signed a Memorandum of Understanding with the Soil Conservation Service to pool their efforts in working with the Districts. The Conservation Department then developed a standard form of Memorandum of Understanding between its Division of Forestry and the Districts of the State. By March 1958, 22 Districts had signed agreements with the Division of Forestry. In the pattern established by these Memorandums, it is the Division of Forestry that serves as the management agent for woodlot operators to assist them in management, harvesting and marketing, while the Districts—buttressed by technical and economic assistance from the Division of Forestry—assist their cooperating farmers to use improved woodland practices to promote a total conservation plan for farm, pasture and wood lands.

To make more wildlife habitat available, Mr. Stoddard recommends cost-sharing agreements between large groups of farmers, represented by their soil conservation districts, and groups of sportsmen, represented by sportsmen's organizations. This is a splendid idea. It is grounded in the recognition that one gets what one pays for. If sportsmen want wildlife shrub cover, the fencing of woodlots and stream banks against grazing, the planting of fenced corners for winter food patches, want duck marshes left alone, and want other such facilities for quail, ducks, grouse, rabbits and deer, they must be willing to help pay for them. I would add, however, that it is not enough to publish this suggestion in the JOURNAL OF SOIL AND WATER CONSERVATION. The farmers and their Districts have long been ready for such cost-sharing. It is the sportsmen's organizations that need to come alive. Mr. Stoddard should write a sequel to his article for publication in [*some publication widely directed to sportsmen.*]

—PHILIP M. GLICK
Washington, D. C.

Philip Glick is practicing law in Washington, D. C. as a member of the firm of Dorfman and Glick. As Assistant Solicitor of the U. S. Department of Agriculture in the 1930's, he was the principal legal draftsman of the Standard State Soil Conservation Districts Law. Comments such as these, representing the views of readers, are indeed welcome.—EDITOR.

MEETINGS

A special Soil and Water Meeting has been arranged by the Pacific Coast Section of the American Society of Agricultural Engineers, to be held on Oct. 9-12 at Riverside, California.

Plans are under way for a tour of the San Dimas Research Center, U. S. Forest Service, where significant field experiments on watershed management are being conducted. A lunch and meetings on watershed management and flood control will be held at the Research Center's Tanbark Flat facility.

Papers will be presented on irrigation, drainage, salinity, soil conservation, flood control and watershed management. (A. F. Pillsbury, University of California, Los Angeles 24, California, is in charge of the paper sessions.)

The Farm Equipment Institute Convention will be held in Atlantic City, New Jersey, September 29-October 1, 1958. For information write FEI, 608 S. Dearborn St., Chicago 5, Ill.

The 7th Annual Surf Fishing Tournament (Nags Head) will be held in the Cape Hatteras National Seashore Recreational Area, North Carolina, October 16-18. This is mentioned in case there are some ardent salt-water fishermen among the *SCSA* conferees. You can work this in ahead of the meeting at Asheville!

The 3rd Annual East Central States conservation conference will be held at Cumberland Falls State Park, Cumberland, Kentucky, October 31-November 2, 1958. Indiana, Kentucky, Michigan and Ohio make up the East Central States. Contact James B. Claypool, Assistant Director, Division of Soil and Water Resources, Kentucky Department of Conservation, Frankfort, Kentucky, for further information.

The 83rd Annual Meeting of the American Forestry Association will be held in the Pioneer Hotel at Tuscon, Arizona, October 27-30, 1958. The general theme of the conference will be Water, Forests, and People.

The Midwest Conservation Education Conference which includes Iowa, Wisconsin, Minnesota and Illinois, will meet October 9-11 at the State 4-H Camp, Luther, Iowa. The conference theme will be "Meeting the Unmet Needs in Conservation Education."

The 6th Annual Grassland Conference will be held at Rutgers University in New Brunswick, New Jersey, October 28, 1958.

PLANS DRIVE FOR IMPROVING SMALL WOODLANDS

Ways and means for improving the condition of the Nation's 4.5 million farm and other small forest properties will be the subject for discussion at a series of regional meetings this fall.

Richard E. McArdle, Chief of USDA's Forest Service, has asked regional foresters, in collaboration with state foresters, to call these meetings to consider the problem of forestry on small forest ownerships and possible methods and procedures for achieving better management on these lands. Mr. McArdle said that these lands "need to make their full contribution if the growing demands for timber from an expanding population are to be met." The meetings will be open. The *SCSA* plans to be officially represented in at least two of these hearings.

Forestry conditions on small woodlands were discussed in Washington recently in consultation with the regional foresters and research directors of the Forest Service. This discussion and the findings of the final *Timber Resource Review*, a report on the country's timber situation now available, led to the conclusion that one of America's best forestry opportunities lies in these small forest ownerships.

Schedule of Small Forest Ownership Regional Meetings

Place	Date	Territorial coverage
Wausau, Wisc.	Aug. 12	Wisconsin
Richmond, Ind.	Aug. 20	Ohio and Indiana
Lansing, Mich.	Aug. 28	Michigan
St. Paul, Minn.	Sept. 4	Minn. and N. Dak.
Boston, Mass.	Sept. 9	N. Y. and New England States
Little Rock, Ark.	Sept. 9	Arkansas
St. Louis, Mo.	Sept. 10	Mo., Ill., & Iowa
Philadelphia, Pa.	Sept. 16	Del., Md., N. J. & Pa.
Coeur d'Alene, Ida.	Sept. 17	Idaho
Santa Fe, N. M.	Sept. 19	Arizona & N. M.
Charlottesville, Va.	Sept. 22	Ky., Va., & W. Va.
Helena, Montana	Sept. 24	Montana
Rapid City, S. D.	Oct. 14	South Dakota
Lincoln, Nebr.	Oct. 21	Nebraska
Manhattan, Kan.	Oct. 23	Kansas
Olympia, Wash.	Nov. 3	Washington
Salem, Ore.	Nov. 6	Oregon

CHAPTERS NEWS

Southern New England Chapter (Conn., Mass., and Rhode Island) got a real taste of marine life at its August 20 meeting, with a visit to the Whaling Museum at Mystic, Conn., and a boat trip on Long Island Sound. Sea food rounded out the taste. The July newsletter included also a roundup of news on members, national office *SCSA* news, and notes on other conservation groups in the area.

Florida Chapter had 140 in attendance at its annual meeting July 17 at Fort Pierce. Featured at this meeting were Robert G. Miller, soil chemist with the Davison Chemical Company of Fort Pierce, and former Governor of Florida, the Hon. Millard F. Caldwell. John H. Herbert and John Barnes are the newly elected chairman and vice-chairman, respectively, for 1958-59. H. A. Matthews is retiring chairman for the chapter. By July 28, Chairman Herbert was contacting by mail all officers of the "sub-chapters" of Florida, and getting a program lined up and committees appointed. A copy of the address of Governor Caldwell was sent to the JOURNAL. Two statements he made are worthy of constant repetition: "We all know that the economic future of Florida depends upon the conservation of its land and water. You are working against great odds of public indifference but you are making progress. . . . [We must] develop and express our convictions on public affairs."

Georgia Chapter had more than 60 members at its second annual meeting, May 16 and 17, Rock Eagle 4-H Club Center, near Eatonton. Most members brought their families. Speakers on the program included D. E. Wade, R. H. Driftmier, Sue Myrick and James K. Vessey. Dr. Cecil H. Wadleigh gave a major address on the "Properties of Water", using slides and molecular models of water to illustrate his talk. A square dance Friday evening left participants drenched in perspiration and happiness. A movies program and swimming and fishing kept the youngsters occupied. Jackson Bennett, chairman of the Chapter in 1958, presided.

Northern Illinois Chapter had 142 persons out for its summer meeting, June 4. Don Williams spoke on "Future Challenges." Agronomists and engineers sported their wares on field trips. Several members from the **Southern Illinois Chapter** and the **Egyptian Chapter** (Illinois) attended. Slides series for use in each district and routed through the County Superintendent of Education office is one of the NIC's activities. The November meeting will have the theme, "Training for Conservation"—to be considered from viewpoints of citizen, teacher and professional conservationist. The July 29 newsletter featured the summer meeting with a page of photographs reproduced by offset.

Hoosier Chapter (Indiana) has Helmut Kohnke and his Conservation Laboratory Committee hard at work. A "workshop" or camp of several days seems to be in the making and will serve both professional workers and non-pros. This sounds like an excellent adult education move that will be watched carefully by other *SCSA* chapters. The fall meeting was scheduled for Sept. 19-20 for southern Indiana and will center on woodland management and products. W. "Bill" E. Madden, refuge manager, Willow Slough Fish and Game Area, was featured in the July newsletter. Ward L. Studor, program chairman for the chapter, sent the JOURNAL editorial office a five page summary of remarks by Paul S. Handwerk, biologist for U. S. Fish and Wildlife Service, Hebron, Ohio, made during the June 20 meeting of the chapter which included a visit to U. S. Fish Hatchery at Rochester, Indiana. (These remarks are available on loan to any person interested.)

Iowa Chapter (Northern Iowa Area) met at Ambrose A. Call State Park on July 26. A visit to the Union Slough Wildlife Refuge, conducted by Harold Burgess of the U. S. Fish and Wildlife Service, was new to most members and a fine highlight. The entire **Iowa Chapter** will hold its annual meeting at Fort Dodge, October 8-9, with a visit to a gypsum mine the first day. "Our Changing Modern Agriculture" will be discussed the second day. Area I (Northern Iowa) will be host.

Fort Hays Chapter (Kansas) received its charter June 15. H. G. Bobst, *SCSA* national councilman, presented the charter and delivered the principal talk for the event. Elected to office for the remainder of the year were: Howard Hughes, chairman; Virgil Quint, vice-chairman; and Bert Soderblom, secretary-treasurer. Meetings will be scheduled at various locations throughout the area served by the chapter.

Kentucky Lake Chapter (Kentucky) performed a nice service in publishing a folder describing Obion Creek Watershed. A map, five photos, and history and measures needed are neatly presented.

Minnesota Chapter will meet Sept. 19-20 concurrently with the State Watershed Congress. The Congress affords a forum for all people to discuss state water problems, with a central theme this year on the watershed approach. [A good place to exhibit the *SCSA* publication, *The Wonder of Water*.] The Vol. I, No. 2 Newsletter continues the high standards and excellent reporting set in No. 1, and appears to be a leader among *SCSA* chapter newsletters. A sample copy can presumably be obtained by writing W. W. Russell, 1504 Crawford, St. Paul.

Mississippi Chapter's West Central Area group met May 23 at Jackson with 80 members and guests. Water management, with specific attention to the Pearl River Reservoir, was discussed by Baxter Wilson, President of the Mississippi Power and Light Company.

Show-Me Chapter (Missouri) in spite of excessive rains during July and August (some of the dews almost caused excessive runoff) has managed to produce a summer annual picnic for 60 members and family associates. Preparation of newsletters is being shared among the five areas of the state, with several feature articles planned. Victor L. Sheldon, agronomist for the Olin Mathieson Chemical Corp., St. Louis, told the group at the annual picnic how radioactivity serves as a valuable tool in plant and fertilizer research. K. G. Harmon was honored. He has served 35 years in Government service and was State Conservationist on retirement.

Hubert Shade had a special report in the July newsletter describing how effectively soil and water structures worked during recent heavy rains.

Oklahoma Council of Chapters held its second annual meeting in Oklahoma City, Sept. 12 and 13, with the theme, "Soils and Plants." The Hoover Equipment Company was host for a social hour and the Thomas Concrete Company printed the programs.

Stillwater Chapter (Oklahoma) had 45 members and wives at its annual picnic. Sam Myer was host and his farm was studied during the meeting, with particular interest in water and desilting basins for ponds. All agreed that this summer outing was a good activity for the group and brought the wives and other members of families in on the aims and activities of the Chapter.

The Chapter aided in getting a **student chapter** established at **Oklahoma State University**, Alva. Earl Nance is the new chapter chairman.

Of special note during the Stillwater chapter summer meeting was a special mimeograph "fact sheet" prepared by Edd Roberts. This device brought the members up-to-date on chapter, state and national affairs of *SCSA* The program for 1958 and activities were listed. Accomplishments were summarized and members were urged to attend the Asheville meeting. S. L. Clifton did a good job in getting excellent attendance at the chapter picnic.

Central Oklahoma Chapter, through Elmer Graham's committee, expects to have at least eight "Club-5" members. [Oklahoma ranks second among all states in membership.] Ted Milford, chapter chairman, may sell the Council's entire quota of the *Wonder of Water* to one person. With proper groundwork, it has been found that this *Society* popular cartoon-style booklet is easy to sell. All chapters in Oklahoma are making a drive to purchase banners in time for the national conference, October 19.

The Knoxville sub-chapter of the **East Tennessee Chapter** meets monthly. In May, Dr. F. F. Bell discussed "Present Concepts of Land Use"; and in June, Prof. Henry Andrews talked about the "Whys of Chemical Weed Control." Vigorous discussion followed both speakers.

According to publicity chairman, T. J. Longwell, this sub-chapter is loaded with excellent speakers and can draft on the University, the TVA and SCS for talent and membership.

Virginia Chapter is shaping up a lively meeting at Natural Bridge Sept. 26-27. A committee is at work with a tape-recorder to get down audially those who were in on the ground floor of the soil and water conservation movement. This project is an excellent one and is being done in cooperation with the parent *SCSA*. According to the latest word (July) the delinquency list has been reduced to four and membership has doubled over 1957. Virginia had, on July 18, at least 158 members. It looks as if a majority of the members will be present at the *SCSA* conference in Asheville, along with an exhibit being prepared by Dorothy Shackelford and Sam Cole.

Inland Empire Chapter (Washington) at its June 17 meeting adopted plans for a Youth Training Camp in Soil and Water Conservation and Watershed Planning. This camp will start in 1959 and is to be sponsored by the Chapter with cooperation from soil conservation districts, the Extension Services, Vo-Ag Departments, and SCS of Idaho and Washington, Washington State College and the University of Idaho. Verle G. Kaiser, P. O. Box 310, Colfax, Washington, headed up a committee of eight in developing the ideas and details of this proposed camp, which will be certainly followed with much interest by other chapters of *SCSA*. A thorough preliminary statement on the proposed camp presumably can be obtained by writing R. L. Kent, 7203 E. Carlisle, Spokane 6, Wash.

Olympic View Chapter (Washington) visited the Thurston county Del Hastings demonstration farm on a summer meeting, June 7, with 100 adults and 25 club members of 4-H in attendance. A talk on weather modification was presented by Stuart Shumway of the State Dept. of Conservation & Development. The next meeting's topic will be "urbanization of agricultural lands". Vern Nelson, chairman of the Chapter, was moderator.

Wyoming Chapter held a three-day summer meeting, July 31 and August 1-2, at Beulah, South Dakota. Many members brought the family and camped out. A field trip featuring many practices and Devil's Tower was capped with a "Ranch" feed and an address by Gale McGee in the evening. A fish hatchery, bird refuge, sawmill and more farm and ranch conservation practices, including some near Spearfish, South Dakota, featured Saturday morning. Win Glover, Arvil Ashment, Louis Schilt, Keith Miller and George Lowham arranged this excellent outing.

SCSA

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As a *Society* member, you can help by letting advertisers know that you appreciate their ads. If an advertisement mentions a free booklet or further information, you can help by writing for it. Advertisers gauge such responses. (Please mention the JOURNAL OF SOIL AND WATER CONSERVATION when writing to advertisers.)

These are available free:

Mechanical Pasturing. 24 page, colorful booklet available from John Deere, Moline, Illinois.

Reprint of an article on an **improved soil moisture meter** and a descriptive **booklet** can be obtained from Industrial Instruments, 89 Commerce Rd., Cedar Grove, New Jersey.

Full details on the 1958-59 Goodyear's sixth nation-wide **Soil Conservation Awards Program** can be obtained by writing A. H. Settle, The Goodyear Tire & Rubber Company, Akron 16, Ohio.

The David White Instrument Company, 2051 North 19th Street, Milwaukee 5, Wisconsin, has a useful booklet, pocket size, on use of the level and level transit. It's titled, **From Point to Point.**

A sound-slide film, **The Use of Gypsum in Agriculture,** can be booked for conservation, vo-ag, and farm groups. Make reservation through Dept. 139, U. S. Gypsum Company, 300 West Adams St., Chicago 66, Illinois.

For free literature on a **specialized fish toxicant,** write to the Chemical Insecticide Corporation, 30 Whitman Avenue, Metuchen, New Jersey.

The *Du Pont Magazine* for February, 1958, contained a brief description of the work on the Remington Farms near Chestertown, Maryland. Here Dr. Joseph P. Linduska aims to show how acreage that is normally wasted can be put to work producing wildlife.

A booklet, **Safe Water for Unprotected Systems,** is available from Sepco Corporation, Pottstown, Pennsylvania.

Available from Editor, *Agricultural News Letter,* Du Pont Company, Wilmington 98, Delaware, is a 52-page booklet telling the **Role of Industry in Modern American Society.**

Allis-Chalmers Manufacturing Company, Tractor Group, Milwaukee, Wis., offers an interesting talk by R. S. Stevenson, President, entitled, **Looking Ahead.**

The new **Lockwood Stubble Mulcher** (Lockwood Grader Corporation of Gering, Nebraska). Write for descriptive literature.

Caterpillar Tractor Co., Peoria, Illinois, released a number of items: **What the Watershed Program Means to the Community;** Package of materials titled, **Successful Power Farming; Soil and Water Conservation** booklet; **Land Forming,** booklet; **Stop Floods Before They Start,** booklet.

For an eye-catcher on a bulletin board, write Allis-Chalmers, General Offices, Milwaukee 1, Wis., for *two* copies of **The Inside Story.** This two-page spread appeared in the March 22, 1958 issue of *The Saturday Evening Post.* (Incidentally, the JOURNAL's contributing artist, Felix Summers, appears in this colorful ad showing a miniature watershed.)

International Harvester Co., Dept. JWSC-5, 180 N. Michigan Ave., Chicago, Ill., offers a free booklet on the watershed development program titled, **"Blueprint for Opportunity Unlimited,"** (Form CR-645-G).

For free literature on John Deere Tractors and Earth Moving Equipment, write to John Deere, Industrial Division, Dept. A-75, Moline, Ill. Information about the John Deere "820" Diesel Tractor is also available from Dept. B75.

Caterpillar Tractor Co., Dept. JS38, Peoria, Ill., offers two free booklets, **Stop Your Floods** and **The Road Ahead.** Also available from Dept. JS58 is the booklet, **Land Clearing.**

A free Harvestore **Farm Profit Plan** booklet and **Haylage information** is offered by the A. O. Smith Corporation, Dept. SW-58, Kankakee, Ill.

For more complete information on **Bemis wide-weave open-mesh,** write to Visinet Mill, Bemis Bro. Bay Co., 2400 S. 2nd St., St. Louis 4, Mo.

Fairbanks, Morse & Co., Dept. JSW-5, 6600 S. Michigan Ave., Chicago 5, Ill., invites you to write for their new illustrated **Bulletin 6957-1.**

NEWS OF MEMBERS

M. W. Lowry of 6648 Woodland Street, Spartanburg, S. C., holds Charter Membership Card No. 44 in the *Society*. His name was inadvertently omitted from the listing of Charter Members carried in the JOURNAL.

Carl E. Haischer of St. Mary's, W. Va., work unit conservationist for the SCS, was selected to receive one of the ten annual professional awards of the American Motors Corporation Conservation Awards. Honored for his work in promoting sound land use, particularly the raising of trees as a cash crop, Carl receives a bronze plaque and $500.

Ernest Swift, director of the National Wildlife Federation, announced that the Federation has started on construction of a permanent headquarters in the 1600 block of 16th Street, N.W., Washington, D.C.

Clayton M. Hoff, executive vice-president of the Brandywine Valley Association was a featured speaker before the Minnesota League of Women Voters in March. His talk was published in the May-June *Conservation Volunteer* (Minnesota Dept. of Conservation).

Robert Jonas, work unit conservationist in New York, taught soils to a group of teachers in a conservation workshop held at Rochester Museum this spring.

In the July, 1958, *Soil Conservation*, **Alexander Nunn,** editor of *The Progressive Farmer* and a Fellow in the *SCSA*, is quoted as telling the Alabama supervisors that "You, working together unselfishly in soil conservation districts, have helped to put spiritual quality into agriculture, a spirit of teamwork and cooperation that we so badly need today."

"Scouts Tackle the Mighty Missisquoi" was a fascinating article in *Outdoor America*, June, 1958, prepared by **Bernhard A. Roth,** head of the field information unit of the SCS, Upper Darby, Pa. The two Scouts were Richard L. Tinsley (his dad is **"Sel" Tinsley,** state conservationist of New Jersey) and Gerald M. Danielson (son of **Kenneth W. Danielson**). Ken recently transferred from Vermont to New Jersey and will be in charge of the watershed planning party. The two Scouts, in a home-made canoe, caught a first-hand perspective of a river system that needs much soil and water conservation work. We have no doubt that through local and statewide press coverage of this trip, and now through the nationally-distributed *Outdoor America* (published by the Izaak Walton League of America), there will be a great many adults and young people better informed on watershed problems, especially along the Missisquoi. There is real significance when Scouts, the Boy Scout conservation program, fathers, journalists, and trained soil and water technicians team up. The educational results, as reported by ace information-specialist Roth, should be far reaching.

Neal H. Bullock, SCS Work Unit Conservationist, was recently presented the Superior Service Award in recognition of outstanding services rendered to farmers in the Bogue Chitto-Pearl River Soil Conservation District from the Franklinton Work Unit in Louisiana. Other *SCSA* members on the program included **Clyde Johnston,** SCS, who presided, **H. B. Martin,** SCS, Hollis R. Williams, SCS, who presented the award to Bullock, and **J. O. Davis,** Executive Secretary of the State Soil Conservation Committee.

J. S. Russell, Past-President of and a Fellow in the *Society*, and farm editor of *The Register and Tribune* and *Iowa Farm and Home Register*, was named as a member of the board of governors of the Agricultural Hall of Fame.

Dwight Meyer, former chairman of the Iowa State Agricultural Stabilization and Conservation, ASC, committee, was recently appointed director of the food and materials requirements section, USDA commodity stabilization service.

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William G. "Bill" Endersbee of the USDI retired July 30 but is reportedly keeping busy in his retirement. He's serving on a committee of the Rock Creek Watershed Association and a symposium in the USDA.

Five *SCSA* members, **C. R. Humphreys, L. G. Hines** and **W. C. Lowdermilk,** who will serve on a panel, and **H. H. Bennett** and **E. H. Graham** are attending the Athens meeting of the International Union for Conservation, September 11-19.

The four **Briggs** brothers and their father, three of which are members of the SCSA, received top billing in the Spring 1958, *Plant Food Review*. **William** is plant materials technician, SCS, **H. Randolph** is a work unit conservationist in Wisconsin and **Rodney A.** is associate professor in the Department of Agronomy and Genetics at the University of Minnesota.

Charles W. Townsend of Colorado and **Horace E. Holman** of Tennessee, both Deputy State Conservationists, were awarded scholarships to attend the Programs of Executive Development for Federal Administrators at the University of Chicago this summer.

Two *Society* members, **Ed Crocker,** SCS and **Frank Starr,** Iowa Conservation Commission, served as faculty members for the tenth annual conservation school for boys of four Iowa counties.

Thomas U. Yager, assistant state soil scientist, SCS, and for the past two years chairman of the Rio Grande Chapter of *SCSA* in New Mexico, has been appointed territorial soil scientist for the SCS in the Carribean area effective August 24. His new headquarters will be San Juan, Puerto Rico.

Walter R. Humphrey, Honorary member of the *SCSA* and *Fort Worth Press* editor, has "A Salute to District Supervisors" in the July issue of *Soil Conservation*.

In the July JOURNAL, page 182, a Wisconsin publication on *Noxious Weed Control* was noticed. We named two editors who are members of the *Society*. In addition, another *Society* member, **Howard Richards,** should have been listed. According to reports, Howard has a "wonderful concept of the importance of the art and science of land use" and brings this to bear in his position as an administrator in the noxious weed section of the Wisconsin Department of Agriculture.

NECROLOGY

Van B. Chaney, SCS, Rosedale, Mississippi, died suddenly on June 19 while in attendance at Athens Training Center, Athens, Ga.

Alden Copeland, chairman of the Inland Empire Chapter and a Charter member of the *Society,* passed away July 9, 1958.

Wilbur Secor, soils specialist at Secor, New York, died on April 19.

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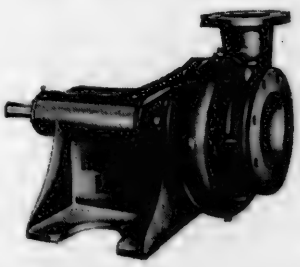

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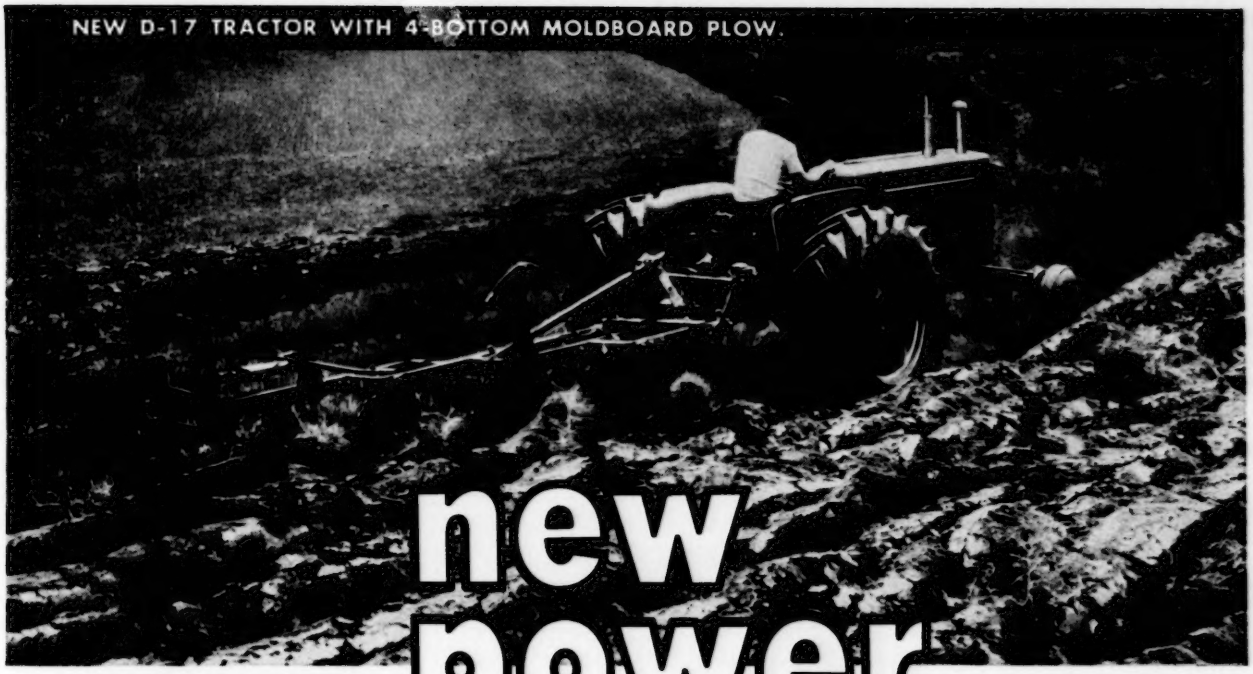

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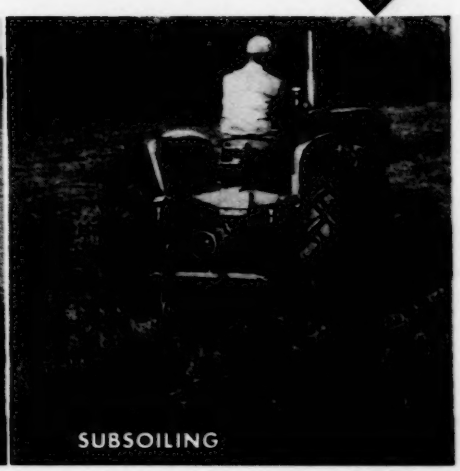

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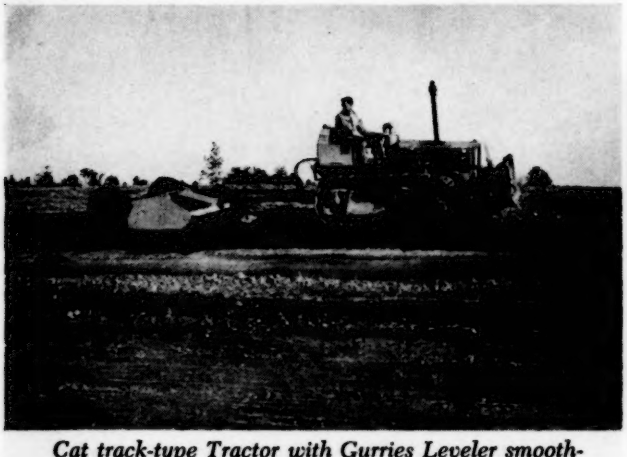

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